HOUSTON-GALVESTON AREA COUNCIL

2021 WATER QUALITY MANAGEMENT PLAN UPDATE








Houston-Galveston Area Council

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

EPA United States Environmental Protection Agency

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FINAL REPORT for CONTRACT NO. 582-21-10118

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WATER QUALITY MANAGEMENT PLAN UPDATE
Fiscal Year 2021

PREPARED IN COOPERATION WITH THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY AND U.S. ENVIRONMENTAL PROTECTION AGENCY

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Prepared by the Houston-Galveston Area Council, in coordination with the Texas Commission on Environmental Quality. This project was funded under a Clean Water Act Section 604(b) grant; TCEQ contract number 582-21-10118.

Houston-Galveston Area Council
3555 Timmons Lane, Suite 120
Houston, TX 77027

For further information, please contact:

Brian Sims
Senior Planner
Community & Environmental Planning
Houston-Galveston Area Council
713-993-2438
brian.sims@h-gac.com

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ABBREVIATIONS LIST

BIG	Bacteria Implementation Group
CCN	Certificate of Convenience and Necessity
CWA	Clean Water Act
CWSRF	Clean Water State Revolving Fund
DMR	Discharge Monitoring Report
EPA	United States Environmental Protection Agency
FOG	Fats/Oils/Grease
FY	Fiscal Year
GBEP	Galveston Bay Estuary Program
GIS	Geographic Information System
GPS	Global Positioning System
H-GAC	Houston-Galveston Area Council
HCPC	Harris County Pollution Control
I&I	Inflow and Infiltration
MGD	Million gallons per day
MPN	Most Probable Number
MUD	Municipal Utility District
NRAC	Natural Resources Advisory Committee
NRCS	Natural Resources Conservation Service
OSSF	On-Site Sewage Facility
PUC	Public Utility Commission of Texas
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
SAB	Service Area Boundary
SEP	Supplemental Environmental Project
SSO	Sanitary Sewer Overflow
TCEQ	Texas Commission on Environmental Quality
TMDL	Total Maximum Daily Load
TPDES	Texas Pollutant Discharge Elimination System
TSWQS	*Texas Surface Water Quality Standards*
TWC	Texas Water Code
TWDB	Texas Water Development Board
USDA	United States Department of Agriculture
WCID	Water Control and Improvement District
WPP	Watershed Protection Plan
WQMP	Water Quality Management Plan
WWTF	Wastewater Treatment Facility

INTRODUCTION

Within the Houston metropolitan region and surrounding counties there are a variety of water quality issues, with elevated levels of bacteria being the most prevalent. Contaminants from both point and nonpoint sources continue to impair the region's streams, rivers, lakes, and bays. To address water quality impairments and concerns and implement watershed-based plans, it is important to have current and accessible data, including geospatial data of regional wastewater infrastructure. Evaluating effluent discharge quality and quantity, as well as the frequency, amounts, and potential causes of unauthorized discharges, is also an important component of planning efforts to address water quality in the region.

The Houston-Galveston Area Council's (H-GAC) Regional Water Quality Management Plan (WQMP) Update helps to address the water quality issues affecting the region by acquiring, compiling, and analyzing water and wastewater data and subsequently making this data accessible to various programs, projects, and stakeholder groups who use the data for planning purposes. The WQMP is updated annually, and these updates are used to guide planning and implementation measures to support current and future efforts and inform decision-makers in their evaluations.

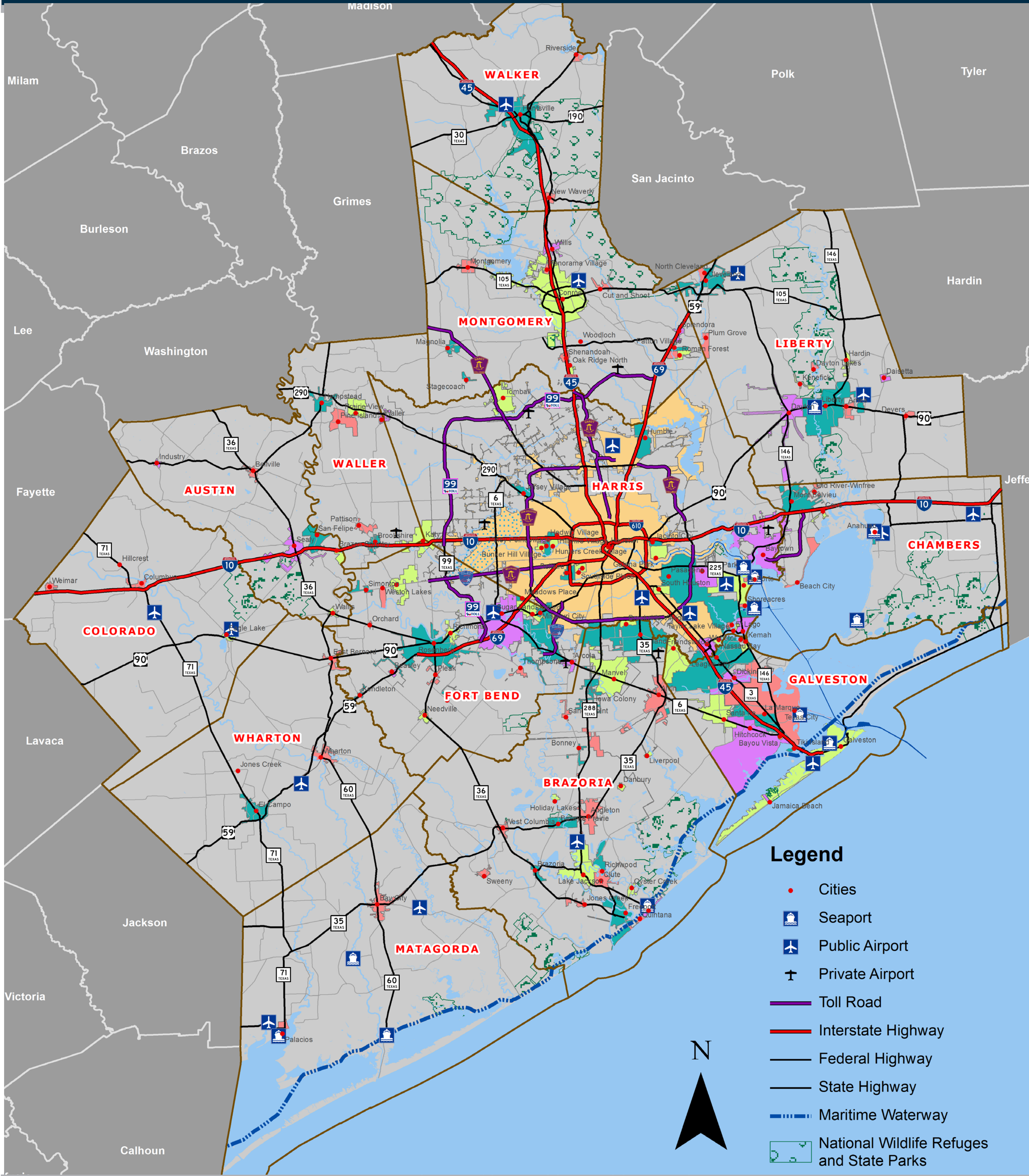
This WQMP Update is a report from the Houston-Galveston Area Council on the Fiscal Year (FY) 2021 activities conducted under Contract 582-21-10118, with funding through a Clean Water Act (CWA) § 604(b) grant by the Texas Commission on

PHOTO: Brays Bayou (Monitoring Station 15854 Downstream)

Environmental Quality (TCEQ). This report will focus on the progress achieved in the primary task objectives set forth in the Project Scope of Work. These tasks are:

1. Project Administration
2. Quality Assurance
3. Wastewater Infrastructure, Data and Permit Update
4. Conformance Review for Clean Water State Revolving Fund Projects
5. Support Watershed Planning
6. On-Site Sewage Facility (OSSF) Planning, Coordination, and Outreach Activities
7. WQMP Coordination
8. Final Report

The H-GAC's WQMP Update Report will become part of the State's Water Quality Management Plan after completion of its public participation process, acceptance by the H-GAC's Board of Directors, and certification by the TCEQ.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Holiday Lakes
West Columbia
Brazoria
Richwood
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Bay City
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Galveston
Jamaica Beach
Dickinson
League City
Nassau Bay
Taylor Lake Village
Santa Fe
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Seaport
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Toll Road
Interstate Highway
Federal Highway
State Highway
Maritime Waterway
National Wildlife Refuges and State Parks
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PROJECT BACKGROUND & SIGNIFICANCE

WATER QUALITY MANAGEMENT PLAN BACKGROUND

The H-GAC is a voluntary association of local governments in the Houston-Galveston region (Region), an area that covers approximately 12,500 square miles and is home to more than 7 million people. H-GAC's service area encompasses 13 counties: Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Harris, Liberty, Matagorda, Montgomery, Walker, Waller, and Wharton (Map 1). H-GAC is the designated water quality planning agency for the Region and is responsible for the development of the regional WQMP.

The annual WQMP Updates are used to guide planning for implementation measures that control and/or prevent water quality problems. The purpose of this WQMP Update is to support current and future planning decisions concerning water quality efforts, wastewater infrastructure development, watershed management, and related issues on both a regional and state level.

Development of the WQMP Update involves acquiring, compiling, and evaluating water and wastewater data, as well as a series of special studies and coordination activities, as requested by the State. The data and information compiled by H-GAC is combined with data from the TCEQ to form a series of integrated datasets to allow for meaningful evaluation of infrastructure and water quality decisions.

The Clean Water Act (CWA) requires the WQMP to be updated as needed to fill information gaps and to revise earlier approved and certified plans. Any updates to the plan need include only the elements of the plan that are new or require modification. This update revises only the information specifically addressed in the included sections. Previously certified and approved WQMPs remain in effect.

The annual WQMP Update is reviewed by the Natural Resources Advisory Committee (NRAC), a policy and technical advisory committee that advises H-GAC's Board of Directors on issues related to natural resources. Its membership includes diverse representatives from local governments, natural resource management agencies, environmental organizations, and the private sector. An opportunity is provided to both the NRAC and the public to review and submit comments on the WQMP Update before the report is finalized. After review, comments are incorporated into the report to produce the final plan, which is submitted to H-GAC's Board of Directors. Once accepted by the Board, the report is submitted to the TCEQ for review and approval. H-GAC's WQMP Update will become part of the State WQMP after it is certified by the TCEQ.

HISTORICAL WATER QUALITY MANAGEMENT PLAN UPDATES

Under previous WQMP projects, H-GAC sought to address aspects of the information and data needs related to water quality issues facing the Region. These projects typically have been a mix of both ongoing efforts and short-term special studies. Some of the project efforts have been continuous, such as wastewater data collection and maintenance. Other efforts have been stand-alone research relating to specific data needs or questions, such as Geographic Information System (GIS) analyses for infrastructure consolidation, Phase II stormwater permit implementation, support for the Coastal Communities project, etc. This balance of continuous and stand-alone efforts allows for the long-term accumulation of data while retaining flexibility to address specific issues.

The ongoing efforts in the FY 21 WQMP project focused on:

- Updating and improving existing regional wastewater infrastructure databases (wastewater treatment facility outfalls and service area boundaries)
- Creating spatial datasets on-site sewage facility (OSSF) locations,
- Support of local watershed-based plans, and
- Coordination and public outreach in support of a Supplemental Environmental Project (SEP) to repair or replace failing OSSFs within the Region.

SIGNIFICANCE

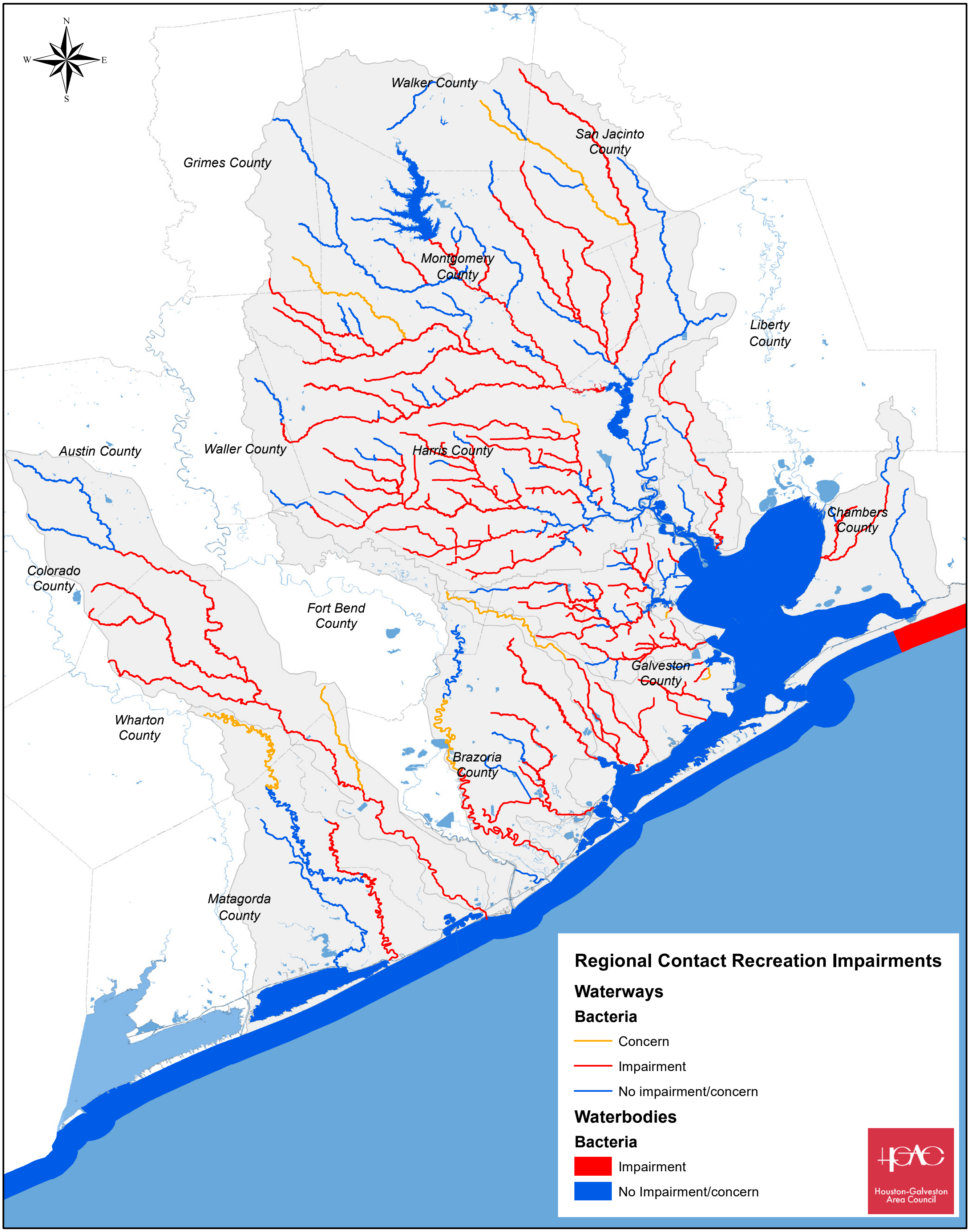
Already one of the largest metropolitan statistical areas in the United States, the Houston-Galveston Region continues to grow at a rapid pace, resulting in a proportional increase in population growth and land development. Development, and its accompanying utility infrastructure, continues into counties beyond the urban core. Existing water and wastewater infrastructure systems continue to age and face challenges related to drought and flooding events. With the Region expected to gain several million additional residents by 2040, these challenges will only be exacerbated in the future.

Within the Region, there are a variety of water quality impairments and concerns. The majority of stream segments in the Region fail to meet the criteria as defined in the *Texas Surface Water Quality Standards* (TSWQS). Many of those water bodies are listed with impairments or concerns in the 2020 T*exas Integrated Report of Surface Water Quality*. Approximately 80 percent of the Region's streams are unable to meet one or more state water quality standards, with the most pervasive issue being elevated bacteria levels in exceedance of the primary contact recreation 1 standard (Map 2). The bacteria in the Region's lakes, creeks, streams, and bayous come from a variety of sources, including human waste, domestic animal waste, pet waste, and wildlife. These wastes may enter the water through point sources, such as discrete "end-of-pipe" discharges, or diffusely through nonpoint sources, carried by precipitation runoff flowing over the land. While some bacteria are naturally occurring, development brings additional bacterial sources and a greater potential impact to water bodies. Careful planning is necessary to address these additional sources.

In addition to the identified water quality issues, numerous developmental challenges exist in the Region as well. The wastewater infrastructure that serves the Region's increasing population has expanded and developed much like the Region itself. As the population has expanded and spread into less urban areas, there has been a proliferation of smaller-sized wastewater treatment facilities (WWTFs) and the creation of a diffuse network of infrastructure to provide utility service to this population. This is partially due to the area's flat topography, as larger centralized WWTFs would require a significant number of costly lift stations to consolidate flow. Due to the availability to fund infrastructure through political subdivisions like Municipal Utility Districts (MUDs) and other special districts, many areas of the Region have a wastewater treatment network that is relatively widespread rather than limited by the bounds of a traditional, centralized model. Development through this model has created a patchwork of wastewater infrastructure, which offers both future challenges and opportunities for local decision-makers.

One of the primary objectives of this WQMP is to collect and analyze data related to wastewater infrastructure in the Region. Wastewater infrastructure is a potential contributor of bacteria into area waterways through improperly treated effluent discharges, or through sanitary sewer overflows (SSOs) from the treatment facilities or throughout the collection systems. Self-reported data from WWTF Discharge Monitoring Reports (DMRs) and SSO violation reports can be analyzed to better evaluate the potential impacts these sources have on bacteria impairments throughout the Region. As the population continues to increase at a rapid pace and the infrastructure continues to age, the integrity of these treatment and collection systems may be harmed. It is important to continuously monitor these systems over time to ensure decision-makers and water resource managers have the necessary information to implement best management practices, repairs, or system replacements in areas with the most need.

The population is expected to continue to rapidly grow in the coming decades, and the ability to make informed decisions regarding water quality and wastewater infrastructure development will be crucial in planning for the Region's future. The accumulation, maintenance, and analysis of regional wastewater and effluent quality data can help inform regional solutions to water quality issues.

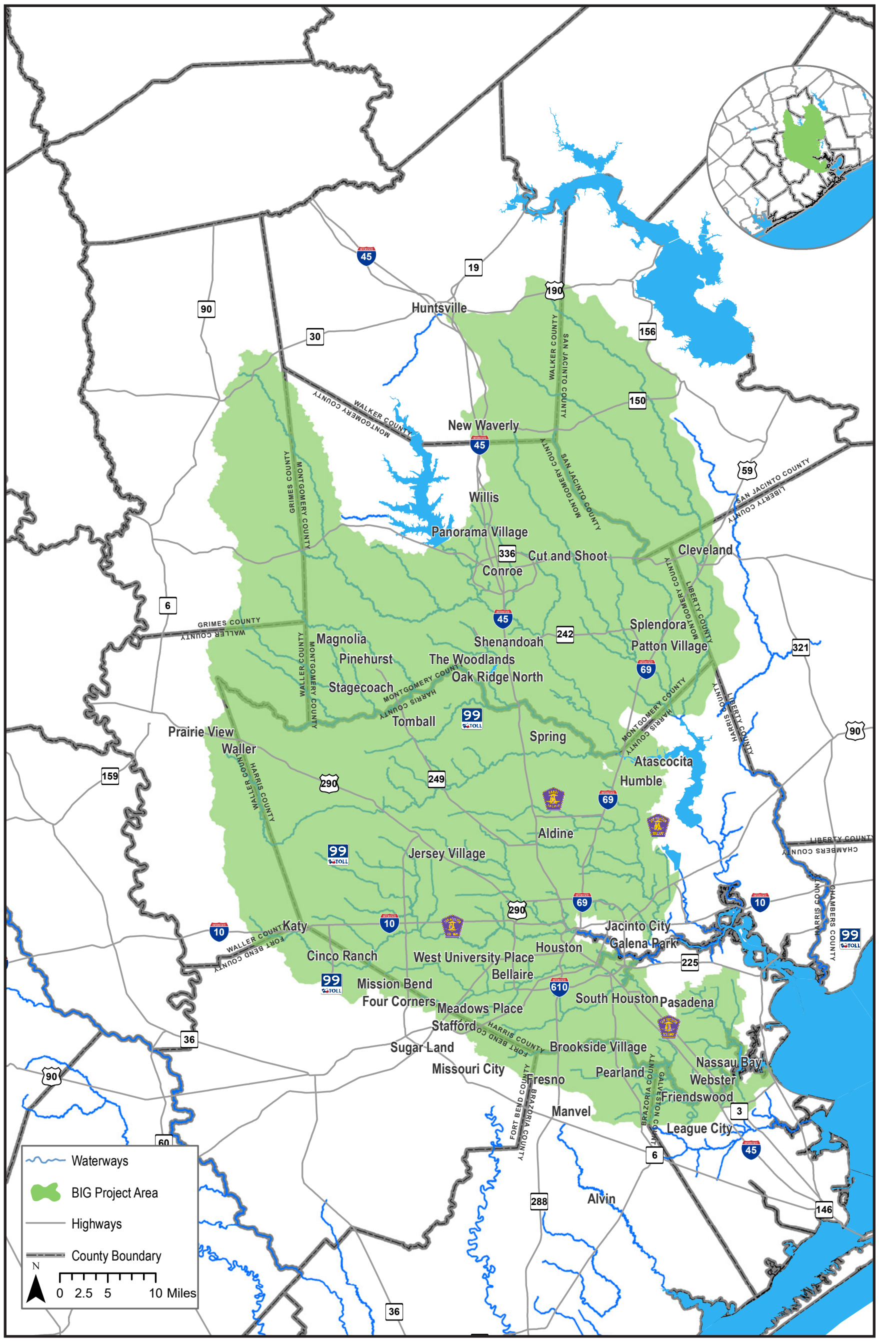


MAP 2: Regional Bacteria Impairments and Concerns (from the 2020 Integrated Report)

In areas that are not served by a sanitary sewer collection system, which includes a sizable portion of the Region, wastewater is treated through use of decentralized on-site sewage facilities (such as aerobic treatment units or conventional septic systems). These OSSFs collect, treat, and disperse wastewater generated by a home or business. When properly designed, sited, and maintained, these systems are an effective form of wastewater treatment. However, if an OSSF fails, which can occur for numerous reasons (improper design, system overload, improper operation, mechanical failure, lack of proper maintenance, etc.), it can contribute to groundwater or surface water contamination. One of the objectives of the WQMP is to maintain a geospatial database of permitted OSSFs and an estimation of locations of unpermitted OSSFs. Typically, these unpermitted OSSFs are those "grandfathered" systems that were installed prior to the State requirement that these systems be permitted.

From a regional perspective, the water quality and wastewater infrastructure decisions facing the Region are more effectively considered on a watershed basis, as contaminants do not adhere to political boundaries along waterways. This is particularly important for watersheds that serve as significant sources of drinking water, such as Lake Houston. H-GAC maintains a large store of relevant and accessible data to provide useful information, analysis, and viable recommendations. The data collection and analysis tasks completed under this WQMP Update project have significant value for a variety of efforts in the Region, such as the development of watershed protection plans (WPPs) or Total Maximum Daily Loads (TMDLs) to address known water quality issues in local waterways.

One of the ways the Region is addressing bacteria issues is through projects such as the Bacteria Implementation Group (BIG). The BIG is a partnership between H-GAC, local governments, businesses, and community leaders who developed and implement a shared plan to reduce bacteria. The BIG Project area (Map 3) is a combination of more than 100 TMDLs in adjacent watersheds. The BIG heavily relies on the information acquired and analyzed under this project.



MAP 3: Bacteria Implementation Group (BIG) Project Area

HOW DOES H-GAC UTILIZE THE DATA ACQUIRED THROUGH THE WATER QUALITY MANAGEMENT PLAN PROJECT?

Internal Data Collection and Regional Data Sharing

The wastewater permit data, service area boundaries, and OSSF location data acquired and/or collected under this WQMP Update project serve to augment existing data sets, inform project decisions on related efforts, and expand internal capabilities of both the H-GAC and TCEQ to incorporate and produce future data and analyses. For example, data were used by the Houston-area Bacteria Implementation Group (BIG) and Basins 11 and 13 TMDL efforts, the Galveston Bay Estuary Program (GBEP), the Clean Rivers Program, and others.

Regional Project Coordination

Maintaining and expanding data resources allows the H-GAC and TCEQ to better understand and facilitate regional coordination between parties involved in wastewater infrastructure decisions and general water quality/watershed protection efforts. Participation in regional groups and coordination efforts helps ensure decisions benefit from the resources compiled under the WQMP.

Source Water Protection

A large portion of the Region's population is served by treated surface water originating in local rivers and lakes. The infrastructure planning and watershed coordination activities of this WQMP Update project help foster a greater understanding of the relationship between water quality issues and steps to help protect drinking water sources.

Project Review

Data and analyses allow H-GAC staff to assist state and federal granting agencies in the review of regional grant applications. These reviews ensure potential projects concur with regional priorities and regional data projections.

Education and Outreach

Data gathered under this WQMP Update project have been used as a focal point or basis for several education efforts, including the OSSF location database and various facilitated meetings, such as the ongoing Natural Resources Advisory Committee.

PROJECT OBJECTIVES

OVERVIEW OF PROJECT TASK OBJECTIVES

The WQMP Update is a report from H-GAC on the FY 2021 activities conducted under Contract 582-21-10118, with funding through a Clean Water Act § 604(b) grant by the U.S. EPA and administered through the TCEQ.

This WQMP Update report focuses on the progress achieved in the primary data collection Task Objectives (Tasks 3 - 6) set forth in the Project Scope of Work. These Task Objectives are:

- Task 3: Wastewater Infrastructure, Data and Permit Update
- Task 4: Conformance Review for Clean Water State Revolving Fund (CWSRF) Projects
- Task 5: Support Watershed Planning
- Task 6: On-Site Sewage Facility (OSSF) Planning, Coordination, and Outreach Activities

Project-related Task Objectives, such as Project Administration, Quality Assurance, and development of the WQMP Update Report will be discussed in a separate Project Final Report.

Each of the primary data acquisition and analysis Task Objectives serves to maintain, expand, or implement H-GAC's store of water quality and wastewater infrastructure data. Each Task Objective is described in a separate section of the WQMP Update report, and includes methodologies, results and observations, and discussion (as appropriate). This report provides a description of the methodologies used to complete these contractual deliverables. Some of the deliverables generated for this project are large electronic data sets unsuitable for full inclusion in a printed version of this Final Report. However, copies of the full electronic data are available, with representative portions of the data included in this report.

For some analyses presented in this report, such as the wastewater treatment facility outfalls, a 15-county area (to include Grimes and San Jacinto counties) is considered due to the location of watersheds of interest. These counties are included in the area monitored by H-GAC as part of its ambient surface water quality monitoring program, known at the Clean Rivers Program.

WASTEWATER DATA UPDATE AND COORDINATION

The goal of this task is to collect and integrate wastewater infrastructure and permit data to support planning for wastewater treatment facilities and water quality projects in the Houston-Galveston region and to support TCEQ in their WQMP Update process. The primary components of this task are:

- Wastewater Infrastructure Geographic Information System (GIS) Data Update
- Wastewater Discharge Monitoring Report (DMR) Data Analysis, and
- Sanitary Sewer Overflow (SSO) Data Analysis

The acquisition and analysis of wastewater infrastructure data, including wastewater outfall locations, adhered to updated Quality Assurance Project Plans (QAPPs) and quality assurance/quality control (QA/QC) methods.

WASTEWATER INFRASTRUCTURE GEOGRAPHIC INFORMATION SYSTEM DATA UPDATE

For the Wastewater Infrastructure GIS Data task, H-GAC updates the service area boundaries and related permitted domestic wastewater outfalls for the Region's wastewater collection and treatment facilities and incorporates the information into GIS. The update, prepared annually, includes a map of the boundaries of the wastewater collection systems within the Region and the geographic location of wastewater treatment facility outfalls.

To update the WQMP, H-GAC utilizes a series of data sets related to the Texas Pollutant Discharge Elimination System (TPDES)-permitted wastewater facilities in the region. These are the Service Area Boundary (SAB) data set and the Wastewater Outfalls data set. A primary task under this Project is to update and continue to integrate these data sources.

To approach this task, H-GAC set out to address the following questions:

- Is there a corresponding service area boundary for every domestic outfall?
- What are the differences between the current and previous outfall locations for current domestic permits?
- Are there any data errors that need to be reported to TCEQ?

Wastewater Outfall GIS Layer Update

The wastewater outfall layer is maintained by TCEQ. This GIS layer identifies the location of TPDES-permitted wastewater treatment facility outfalls for the region. Each year, as part of the WQMP Update process, H-GAC acquires an updated wastewater outfalls GIS data set from TCEQ. The Wastewater Outfalls data set is available for download from TCEQ's website at the following URL:

https://gis-tceq.opendata.arcgis.com/datasets/wastewater-outfalls

The data for this year's report were acquired on 3/9/21.

For this Project, H-GAC examined the domestic wastewater outfalls in the 15-county region. In the metadata for the GIS layer provided by TCEQ, the outfalls are classified with descriptors. The outfalls examined for this project include those categorized as "D" or "W" in the data dictionary. The "D" category represents domestic outfalls at <1 MGD (millions of gallons per day) domestic sewage. The "W" category includes wastewater outfalls ≥1 MGD domestic sewage or process water, including water treatment facility discharge.

As the focus of this analysis is on domestic discharges, the "D" category was automatically included in H-GAC's evaluation. To determine which facilities in the "W" category were domestic and which were industrial, the permit numbers were queried using TCEQ's water quality permit registry, which is located at the following URL:

https://www6.tceq.texas.gov/wqpaq/index.cfm

Permits in the "W" category identified as Public Domestic Wastewater or Private Domestic Wastewater were included in the domestic wastewater outfall layer. Industrial discharges were excluded from analysis, as these are tied to a single location and not a service area.

Service Area Boundary GIS Layer Update

The SAB data set is a GIS layer maintained by H-GAC. This file contains a spatial representation of the service area boundaries of the permitted domestic wastewater dischargers in the region. Typically, these boundaries include municipalities, Municipal Utility Districts (MUDs), Water Control and Improvement Districts (WCIDs), other public districts, and private utilities that serve an area greater than a single facility. Industrial permittees are not included in the SAB data set as these dischargers typically only serve a single facility.

H-GAC utilizes data from multiple sources (MUD records, EPA and TCEQ permit databases, etc.) to update the service area boundary and outfall layer data sets. In addition, H-GAC also utilized the Public Utility Commission of Texas' (PUC) Certificates of Convenience and Necessity (CCN) data set to match outfalls to service area boundaries. A CCN grants the holder the exclusive right to provide retail water and/or sewer utility service to a defined geographic area. If a CCN is issued, it may serve as a proxy for the service area boundary, as the CCN holder is required to provide continuous and adequate service within its CCN boundary.

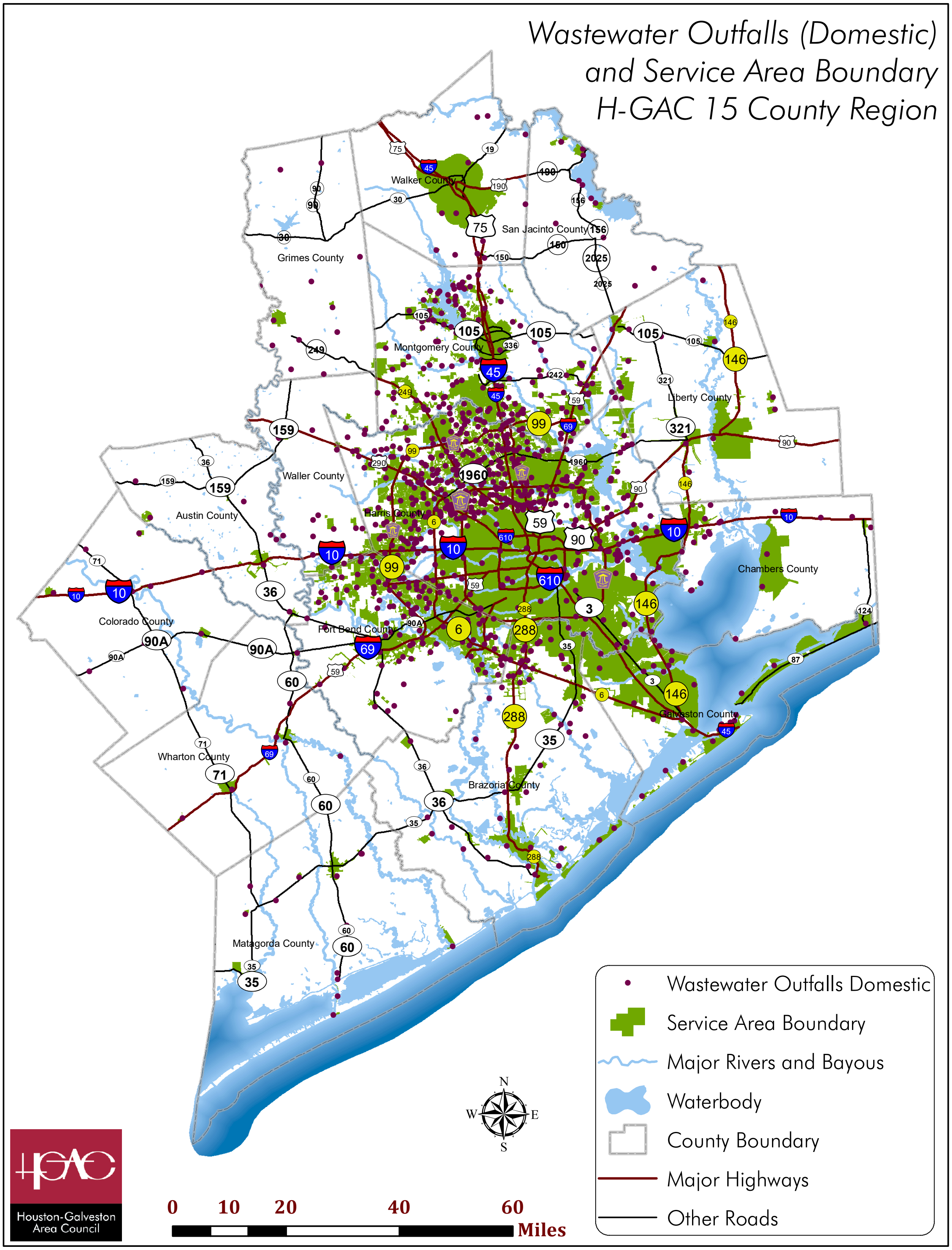
A manual review of the GIS outfall layer and service area boundaries was performed to identify outfalls without an associated service area boundary. To address small private systems without an associated service area boundary, and to help develop boundaries for these systems, the SAB data set was compared to other sources of boundary data, such as city boundaries and the CCNs available through the PUC. These city boundaries and CCNs can serve as proxies for the service area boundary until H-GAC staff can reach out to the individual entities for verification of their service areas. These proxy boundaries were added to the service area boundary GIS layer.

Map 4 shows the service area boundaries alongside the domestic outfalls locations. The new Outfalls and Service Area Boundaries GIS layers will be used to inform other programs and projects, such as the Clean Rivers Program, the BIG, and various TMDL and WPP projects.

Appendix C shows the location of permitted wastewater outfalls by watershed.

Updated data sets were submitted to TCEQ in digital format with this report. These data sets created under this project are listed in Appendix A. These data are too large to include in the report, but are available upon request.

MAP 4: Domestic Wastewater Outfalls and Service Area Boundaries in the 15-County Region



WASTEWATER DISCHARGE MONITORING REPORT DATA ANALYSIS

The Wastewater DMR Data Analysis for this project involves the acquisition and analysis of self-reported discharge monitoring data for regional permitted facilities. The WQMP Update specifically evaluates bacteria discharges, but other constituents may be evaluated if a water body-specific or facility-specific need is identified, or if requested by stakeholders.

As part of the analysis for the WQMP Update, H-GAC acquired self-reported DMR data for permitted facilities through TCEQ and EPA to evaluate bacteria permit limit exceedances for the period of 2016–2020.

As defined in the *Texas Surface Water Quality Standards*, the *E. coli* geometric mean criterion for primary contact recreation 1 for ambient surface water is 126 most probable number (MPN) per 100 milliliters (mL), and 399 MPN/100 mL for single grab samples. For enterococci, which is the designated indicator organism for tidal segments, the criterion for the geometric mean is 35 MPN/100 mL, with a single sample criterion of 89 MPN/100 mL. TCEQ does not apply the single sample criterion for their assessment.

In most cases, these standards are generally applied as an effluent permit limit for WWTFs. In the Region, the majority of TPDES permits have effluent limitations set for *E. coli*. However, some permits have enterococci as the indicator organism. Select WWTFs may have more stringent bacteria permit limits depending on site-specific conditions or participation in TMDL projects like the BIG.

Effluent discharges from WWTFs are regulated by TCEQ, with water quality limits specified in each discharger's permit. Both TCEQ and Harris County Pollution Control Services perform effluent monitoring for compliance with water quality permits through their inspection and enforcement programs. These effluent discharge limits are also monitored by WWTF personnel on a frequency dependent on facility size, location, wastewater type (domestic or industrial), and other factors. Results from field measurements (pH, dissolved oxygen, instantaneous flow, etc.) and laboratory analyses (biochemical oxygen demand, total suspended solids, ammonia, etc.) from these required monitoring events are submitted to the TCEQ monthly as a Discharge Monitoring Report.

Evaluating trends in permit exceedances for indicator bacteria is important in understanding the impact WWTFs may have on overall surface water quality. DMRs are the most comprehensive data available for the broad regional evaluations conducted under the WQMP Update, even though there are some inherent uncertainties. As with any self-reported data, there is an expectation that some degree of uncertainty or variation from normal conditions may occur. Additionally, samples are collected at the weir and not at the end of the outfall pipe, so results generated do not take into account potential bacterial regrowth in the outfall pipe.

The data acquired under this task continues to be widely used by local projects and entities. Water quality protection efforts, including the various watershed protection plans, TMDLs, and the Clean Rivers Program, use the data to guide and inform planning decisions.

For this project, H-GAC staff evaluated the occurrence of self-reported bacteria violations through domestic WWTF DMRs in the region for the period of 2016–2020. Evaluations were based on the regulatory permit limits specific to each facility and consider the number of exceedances and bacteria loadings by year and by WWTF size. The data analyzed for this project are self-reported by WWTFs and samples are collected before the end of the outfall pipe, so results do not consider the effect of bacteria regrowth.

DMR data for this analysis were acquired from EPA on 3/9/21. The wastewater outfall GIS layer was acquired from TCEQ on 3/9/21. The acquisition and analysis of wastewater infrastructure data adhered to updated QAPPs and QA/QC methods.

The number of permittees can change from year-to-year, and multi-year comparisons are based on the current wastewater outfall GIS layer. Therefore, slight variations may be present from the data presented in this report and previous or subsequent reports. The data presented in this report are accurate as of the date the data were acquired, but previous or subsequent data could be slightly different based upon the number of outfalls present at the time of that data acquisition.

Permitted Outfalls in the Region

Based on the GIS data acquired from TCEQ, there are 1,243 permittees in the TCEQ Outfall Layer, with the EPA Registry showing 1,231 permittees (Table 1). This discrepancy is most likely due to new permits approved by TCEQ but not yet entered into the EPA Registry.

Of the permittees in the Registry, self-reported DMR data (of any type) were submitted for 1,001 outfalls, with bacteria data being submitted for 886 of the outfalls.

Of the permittees submitting bacteria DMR data, 795 are domestic WWTFs, and 91 are industrial facilities. Table 2 provides a summary of the WWTFs submitting DMR data in 2020.

TABLE 1: Wastewater Outfalls, 2020

WWTF Type	Permittees Submitting DMR Data (any type)
Permittees in the TCEQ Outfall Layer	1,243
Permittees in the EPA Registry	1,231
Permittees submitting DMR data (any type)	1,001
Permittees submitting DMR bacteria data	886

TABLE 2: DMR Data Submission Summary, 2020

WWTF Type	Permittees Submitting DMR Data (any type)	Permittees Submitting DMR Bacteria Data
Domestic	801	795
Industrial	200	91
TOTAL	1001	886

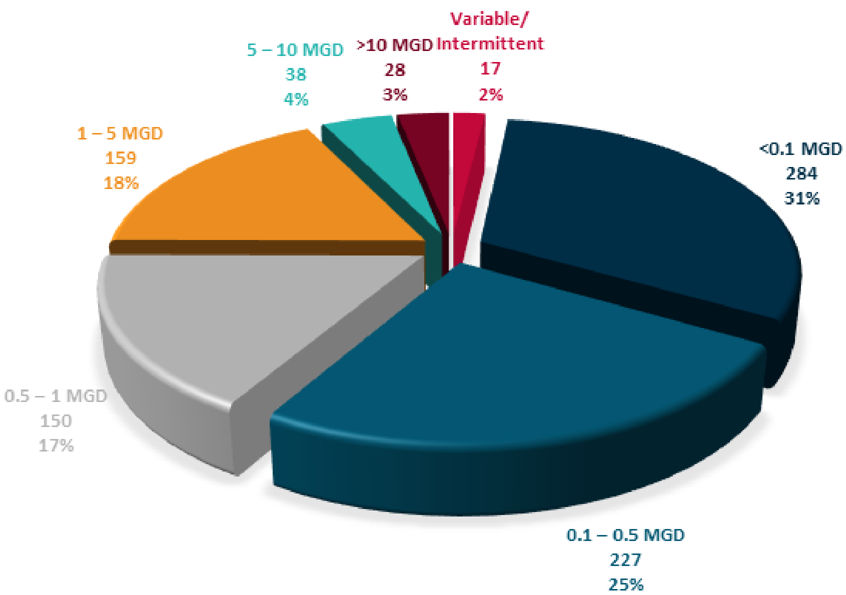
Facilities by Relative Plant Size

For many of the analyses in this report, WWTFs are evaluated on relative facility size, as categorized by daily flow in millions of gallons per day (MGD). Those facility size categories and the number of facilities per category are shown in Table 3 and Figure 1. The total number of dischargers submitting bacteria DMR data shown in Table 2 (886 WWTFs) differs from that in Table 3 (903 WWTFs) due to a difference in the time frame the data represent. The values shown in Table 2 are based on 2020 data only. The number of WWTFs by size shown in Table 3 are calculated using data from 2016–2020 so permit exceedance rates by year and facility size can be determined.

TABLE 3: Number of WWTFs Reporting Bacteria DMR Data by WWTF Relative Facility Size, 2016-2020

WWTF Facility Size by MGD	Number of Facilities, 2016 - 2020	Percentage of Facilities
Variable/Intermittent	17	1.88%
<0.1 MGD	284	31.45%
0.1 - 0.5 MGD	227	25.14%
0.5 - 1 MGD	150	16.61%
1 - 5 MGD	159	17.61%
5 - 10 MGD	38	4.21%
>10 MGD	28	3.10%
TOTAL	903	100.00%

FIGURE 1: Percentage of WWTFs by Relative Facility Size, 2016-2020



Within the Region, the largest number of WWTFs are in the <0.1 MGD category (31.45% of facilities) followed by those in the 0.1 – 0.5 MGD category (25.14% of facilities). Combined, these two categories represent over half of the permitted domestic facilities submitting bacteria data in the Region. Considering the growth patterns within the Region and the proliferation of MUDs and other special districts, it is expected that the number of these smaller facilities would be very high in the region.

WWTFs in the Variable/Intermittent category represent the smallest group, at 1.88% of all facilities.

Bacteria DMR Data Analysis and Permit Exceedances

In 2020, WWTFs within the Region self-reported a combined 6,451 bacteria geometric mean results and 6,636 bacteria single grab sample results. Of these reported results, 60 of the geometric mean results (0.9%) and 109 of the single grab sample results (2.9%) exceeded permit limits (Table 4). These records include only those outfalls with permit limits. Facilities that test and report data but do not have a permit limit are not included in these numbers.

TABLE 4: Bacteria DMR Data Reported and Permit Exceedance Rates, 2020

Bacteria Data Reported	Geometric Mean Results	Daily Maximum or Single Grab Sample Results
Total Results Reported	6,451	6,636
Total Exceeding Limit	60	109
Percent Exceedance	0.9%	2.9%
Percent Compliance	99.1%	97.1%

Geometric mean and single grab bacteria reporting and compliance data for 2020 were evaluated by relative facility size. Table 5 shows the number of geometric mean and single sample results reported, the number exceeding permit limits, and the percent exceedance for each of the WWTF relative facility size categories.

TABLE 5: Bacteria DMR Data Permit Exceedance Rates by Relative Facility Size, 2020

Relative Facility Size	Geometric Mean Results Reported	Geometric Mean Results Exceeding Permit Limit	Geometric Mean Percent Exceedance	Daily Maximum or Single Grab Results Reported	Single Grab Results Exceeding Permit Limit	Single Grab Results Percent Exceedance
Variable/Intermittent	101	6	5.9%	101	6	5.9%
< 0.1 MGD	1,119	18	1.6%	1,174	29	2.5%
0.1 – 0.5 MGD	1,886	24	1.3%	1,964	39	2.0%
0.5 – 1 MGD	1,315	4	0.3%	1,325	36	2.7%
1 – 5 MGD	1,435	6	0.4%	1,444	56	3.9%
5 – 10 MGD	351	2	0.6%	363	12	3.3%
> 10 MGD	244	0	0%	265	12	4.5%
TOTAL	6,451	60	0.9%	6,636	190	2.9%

WWTFs in the 0.1 - 0.5 MGD category have the largest number of samples reported (both geometric mean and single grab samples), with the smallest number being for facilities in the variable/intermittent category. The variable/intermittent category has the highest percent exceedance for both geometric mean and single grab samples. This is likely due to the smaller number of samples being collected and analyzed, since sampling is only conducted when these facilities discharge. WWTFs in the >10 MGD category had a higher single grab percent exceedance (4.5%) than other categories (excluding the variable/intermittent dischargers), most likely due to the higher frequency of sampling conducted at these facilities. The geometric mean exceedance rate for the >10 MGD category was 0.0%, with no geometric mean results reported above the permit limit..

Geometric mean and single grab bacteria sampling and compliance data were also evaluated by year. Table 6 shows the number of geometric mean and single grab sample results reported, the number exceeding permit limits, and the percent of samples exceeding permit limits for each year (2016 - 2020). In general, results indicate a small number of bacteria permit exceedances are reported annually. For 2020, 60 of 6,451 geometric mean results, or 0.9%, were reported as exceedances. Of the 6,636 single grab samples reported, 190 results, or 2.9%, were reported as permit exceedances in the self-reported DMR data. Overall, rates of compliance were high across all relative facility size categories, with 97.1% of single grab samples and 99.1% of geometric mean results meeting effluent permit limits.

TABLE 6: Bacteria DMR Data Permit Exceedance Rates by Year, 2016 - 2020

Year	Total Geometric Mean Results Reported	Samples Exceeding Geometric Mean Permit Limit	Geometric Mean Percent Exceedances	Total Grab/ Max Results Reported	Samples Exceeding Single Grab/ Daily Max Permit Limit	Single Grab/ Daily Max Percent Exceedances
2016	7,536	95	1.3%	8,043	278	3.5%
2017	7,776	78	1.0%	8,262	301	3.6%
2018	7,871	69	0.9%	8,407	271	3.2%
2019	8,342	87	1.0%	8,676	304	3.5%
2020	6,451	60	0.9%	6,636	190	2.9%

Bacteria DMR permit exceedance data were also analyzed by year and relative facility size. Table 7 shows the bacteria permit limit exceedance rates for each facility size category for geometric mean samples for the period of 2016–2020. Table 8 shows the exceedance rates for single grab sample results for the same time period.

The highest rate of bacteria permit exceedances for geometric mean data are observed with WWTFs in the variable/intermittent discharge category (Table 7). These facilities are typically small and discharge infrequently and at a smaller volume than most facilities. Generally, permit exceedances for geometric mean permit limits are low, with the exception of the variable/intermittent dischargers.

TABLE 7: Bacteria DMR Data Geometric Mean Permit Exceedance Rates by Relative Facility Size and Year, 2016 - 2020

Relative Facility Size	2016	2017	2018	2019	2020
Variable/Intermittent	50.0%	25.0%	24.4%	13.3%	5.9%
<0.1 MGD	1.5%	1.5%	0.7%	1.4%	1.6%
0.1 - 0.5 MGD	1.6%	1.2%	1.1%	1.1%	1.3%
0.5 - 1 MGD	0.4%	0.3%	0.2%	0.5%	0.3%
1 - 5 MGD	0.8%	0.8%	0.6%	0.9%	0.4%
5 - 10 MGD	1.3%	0.5%	1.5%	0.9%	0.6%
>10 MGD	0.0%	0.4%	0.8%	1.0%	0.0%

Higher permit exceedance rates are observed with the single grab samples (Table 8) as compared to the geometric mean results (Table 7). However, this is to be expected. For smaller facilities, dischargers may only have to sample once per quarter or once per month. For larger facilities with higher flow volumes, sampling frequency may increase to weekly or daily, with multiple single grab results for each facility each month, but only one geometric mean result reported.

TABLE 8: Bacteria DMR Data Single Grab Sample Permit Exceedance Rates by Relative Facility Size and Year, 2016 - 2020

Relative Facility Size	2016	2017	2018	2019	2020
Variable/Intermittent	16.3%	12.2%	9.8%	8.6%	5.9%
<0.1 MGD	1.8%	2.7%	1.7%	2.6%	2.5%
0.1 - 0.5 MGD	2.1%	2.3%	1.9%	2.3%	2.0%
0.5 - 1 MGD	1.2%	2.1%	1.6%	2.6%	2.7%
1 - 5 MGD	5.5%	5.0%	5.5%	5.1%	3.9%
5 - 10 MGD	9.2%	7.5%	6.9%	5.7%	3.3%
>10 MGD	10.1%	11.3%	8.0%	8.1%	4.5%

Overall, bacteria permit limit exceedance rates are low and WWTFs in the region are usually within permit compliance. However, it is important to remember that these DMR data are self-reported and therefore have some inherent uncertainty. In many cases, these samples are collected at the same time each day, which may bias the results if sample collection is postponed until conditions are ideal. Wastewater treatment facility compliance inspection data from Harris County Pollution Control (HCPC) are acquired for the BIG project and show higher rates of permit exceedances than are observed in the self-reported data. This is likely due to the more random nature of compliance inspection monitoring (i.e., it is not biased to certain days, time of day, flow conditions, chlorine residual levels, etc.). The HCPC compliance data are acquired under the BIG and not under this project's QAPP. Therefore, those results are not reported as part of the WQMP Update. However, this data, combined with the data generated under this WQMP project, are an important cornerstone for the analyses that inform activities of the BIG. The BIG addresses bacterial impairments within a sizable portion of the Region (see Map 3 in "Significance" section).

In addition to the analysis of the exceedance rates for the geometric means previously discussed, the geometric mean of the reported geometric mean and single grab *E. coli* sample results were calculated. This analysis calculated the geometric mean for all results reported each year for each relative facility size category. Results of these analyses are presented in Table 9 (for geometric mean samples) and Table 10 (for single grab samples).

The geometric mean calculation normalizes the range of values being averaged and shows the typical value or central tendency of the data set, so that outliers (such as an atypical elevated single grab value) do not overly influence the results, as would be the case if an arithmetic mean were utilized. While this data does not allow us to draw conclusions about any single facility, it is useful to look at the data in aggregate. As these data show, the highest geometric means are observed for the Variable/Intermittent discharge category. For 2020, the geometric mean of the reported DMR *E. coli* geometric mean data was 16 MPN/100 mL for that category (Table 9).

TABLE 9: Geometric Mean (in MPN/100 mL) of E. coli DMR Geometric Mean Results by Relative Facility Size and Year, 2016 - 2020

Relative Facility Size	2016	2017	2018	2019	2020
Variable/Intermittent	199	124	83	56	16
< 0.1 MGD	2.3	2.1	2.1	2.3	2.0
0.1-0.5 MGD	2.0	2.0	2.0	2.0	1.9
0.5-1 MGD	1.8	1.8	1.8	1.8	1.8
1-5 MGD	2.3	2.3	2.5	2.4	2.4
5-10 MGD	2.1	2.0	2.0	1.7	1.8
> 10 MGD	2.0	2.3	2.3	2.2	2.4

TABLE 10: Geometric Mean (in MPN/100 mL) of E. coli DMR Single Grab Sample Results by Relative Facility Size and Year, 2016 - 2020

Relative Facility Size	2016	2017	2018	2019	2020
Variable/Intermittent	284	191	124	82	24
< 0.1 MGD	2.9	2.8	2.6	3.0	2.6
0.1-0.5 MGD	2.4	2.5	2.4	2.4	2.2
0.5-1 MGD	3.0	3.2	3.1	2.9	2.7
1-5 MGD	8.0	7.7	9.0	7.9	7.3
5-10 MGD	16	14	11	8.5	8.7
> 10 MGD	20	17	17	18	18

For the single grab sample data (Table 10), the geometric mean for 2020 *E. coli* samples for all size categories was well below the water quality standard of 126 MPN/100 mL. The highest geometric mean was for the variable/intermittent size category, with a result of 24 MPN/100 mL. This result is expected due to the infrequency of discharge and the smaller number of values used to calculate the geometric mean. The next highest geometric mean was for the >10 MGD category, with a geometric mean of 18 MPN/100 mL. For other size categories, the geometric means of the DMR *E. coli* geometric mean data was much lower, with results below 9.0 MPN/100 mL for all other categories, and below 3.0 MPN/100 mL for the <0.1, 0.1-0.5, and 0.5-1 MGD categories.

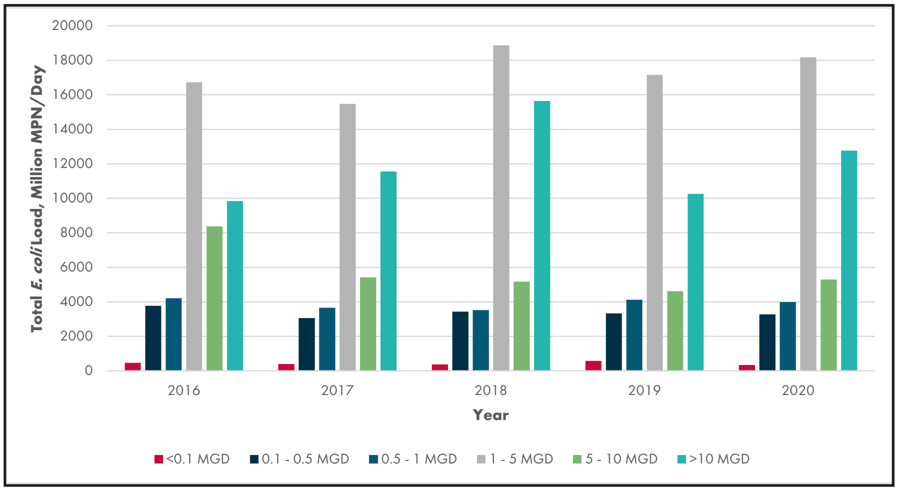
The estimated *E. coli* daily loads (in Millions MPN per day) from domestic WWTFs are shown in Table 11. Results are shown by year and relative facility size, and are based on WWTF effluent discharge rates and average *E. coli* geometric mean concentrations reported by facility size.

For the period of 2016 — 2020, WWTFs in the 1 — 5 MGD size category contributed the most bacteria loading. In 2020, the estimated bacteria loading for this facility size category was 18,174.9 Million MPN per Day (or 1.82×10^{10} MPN/Day). WWTFs in the <0.1 MGD size category contributed the least amount of bacteria loading. Although this category represents the largest number of facilities [284 WWTFs, or 31.45% of the total number of facilities(as shown in Table 3)], the relatively low flow rates for this category helps minimize the amount of bacteria loading entering local waterways. Load calculations were not performed for the Intermittent/Variable facility due to the infrequent nature of their discharges and variability of their flow rates. Figure 2 shows the year-to-year comparison of the estimated *E. coli* load (in Million MPN/Day) for each relative WWTF size category.

TABLE 11: Estimated E. coli Load (in Million MPN/Day) from Domestic WWTFs by Relative Facility Size and Year, 2016 - 2020

Relative Facility Size	2016	2017	2018	2019	2020
<0.1 MGD	467.0	401.3	380.6	578.9	339.3
0.1 - 0.5 MGD	3,767.5	3,063.0	3,435.9	3,329.6	3,272.6
0.5 - 1 MGD	4,210.2	3,660.7	3,520.5	4,127.1	3,982.9
1 - 5 MGD	16,726.5	15,475.8	18,868.4	17,150.6	18,174.9
5 - 10 MGD	8,380.5	5,413.8	5,171.1	4,614.2	5,294.4
>10 MGD	9,843.8	11,562.1	15,643.5	10,263.0	12,764.6

FIGURE 2: Estimated E. coli Load (in Million MPN/Day) from Domestic WWTFs by Relative Facility Size and Year, 2016 - 2020

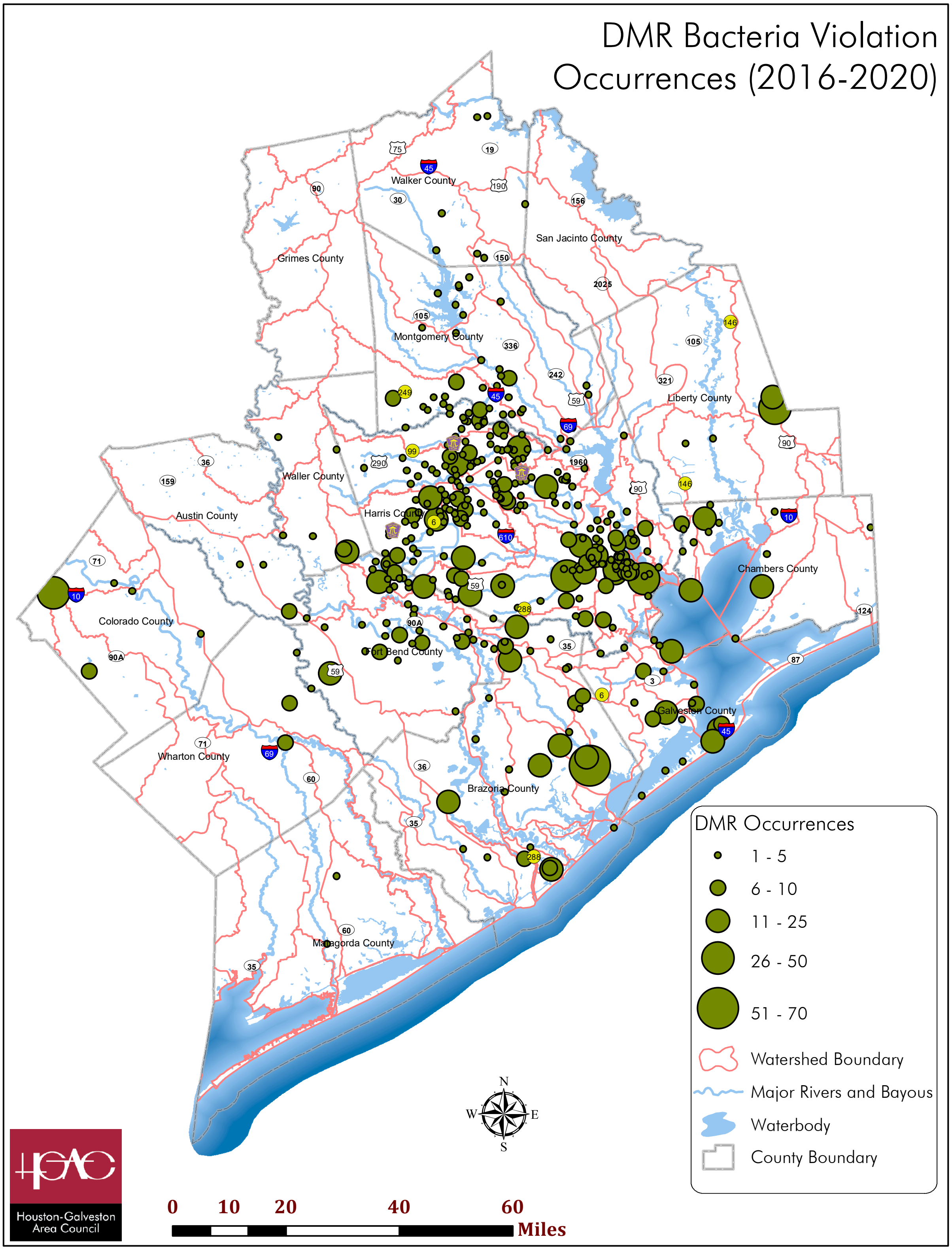


Maps 5 — 8 illustrate the frequency of DMR bacteria violations and the density of those violations by watershed. Maps 5 and 6 show this data for the period of 2016 — 2020. Maps 7 and 8 show this data for 2020. These maps illustrate areas in the region that have the highest rate of permit exceedances based on the reported DMR data acquired from TCEQ. It is evident that the more populated urban and suburban areas present in the region experience the greatest number of bacteria violations compared to more rural watersheds along the region's perimeter. It should be noted that spatial analysis of DMR exceedances are based on the location of WWTF outfalls. On Maps 6 and 8, watersheds that have no outfalls located within their boundary are shown in white to indicate that there are no data. On Maps 5 and 7, no symbols appear on those watersheds. That does not imply that there are no bacteria issues within these watersheds, just that there are no permitted point source discharges.

The DMR bacteria violation frequency map illustrates that the more populated urban and suburban areas in the region are experiencing the highest rate of bacteria violations. However, it should be noted that the density of WWTF outfalls in urban and suburban centers is much greater than the less populated watersheds in the region, therefore it would be expected that the number of DMR bacteria violations would also be higher.

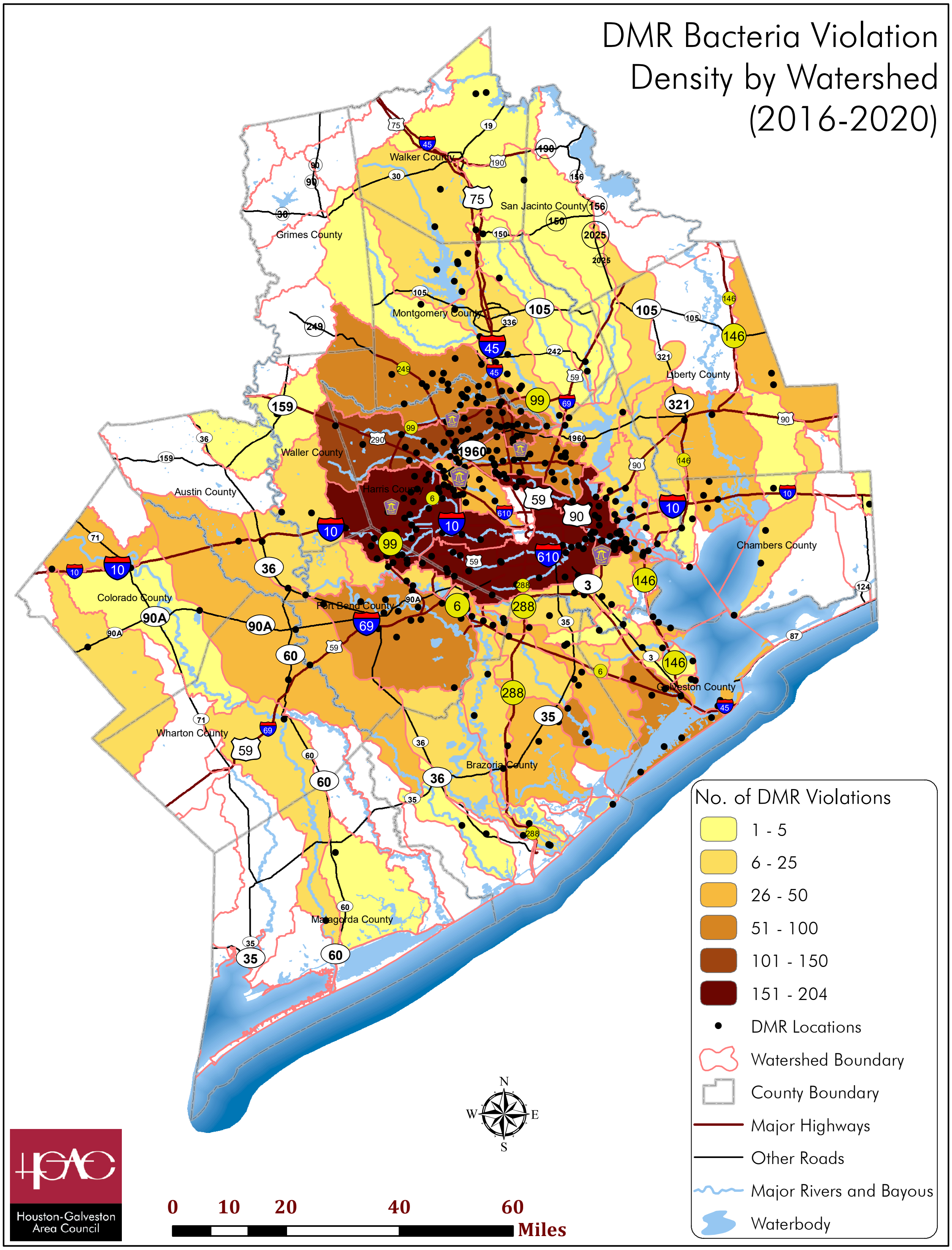
MAP 5: DMR Bacteria Violation Occurrences, 2016-2020

Map 5 shows the occurrences of DMR violations for the period of 2016 - 2020.



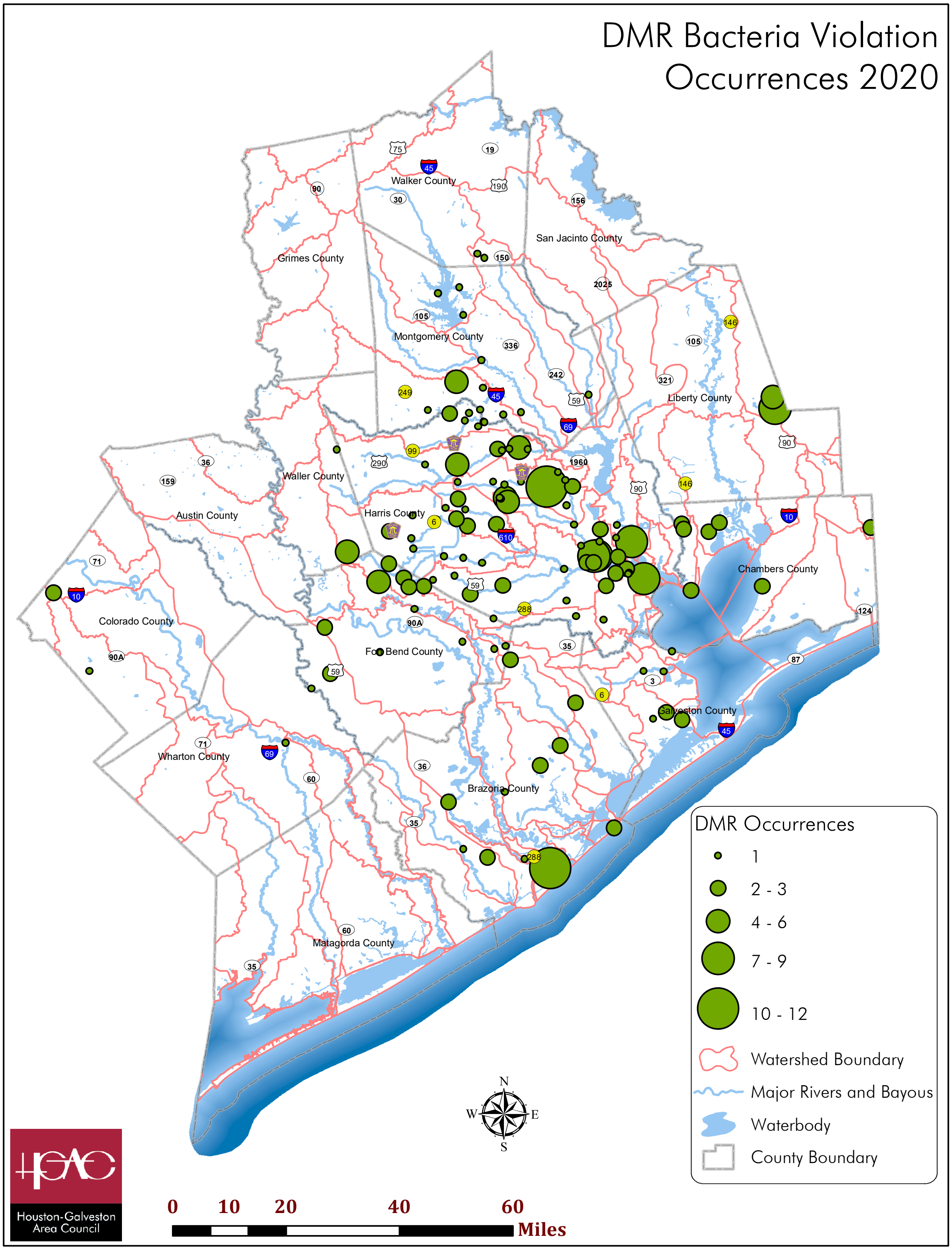
MAP 6: DMR Bacteria Violation Density by Watershed, 2016-2020

Map 6 illustrates the frequency of reported DMR bacteria violations by watershed for 2016 - 2020. Violations are mapped based on WWTF addresses and service area boundary data. Watersheds with insufficient service area boundary data or no WWTF outfalls are shown as having no data.



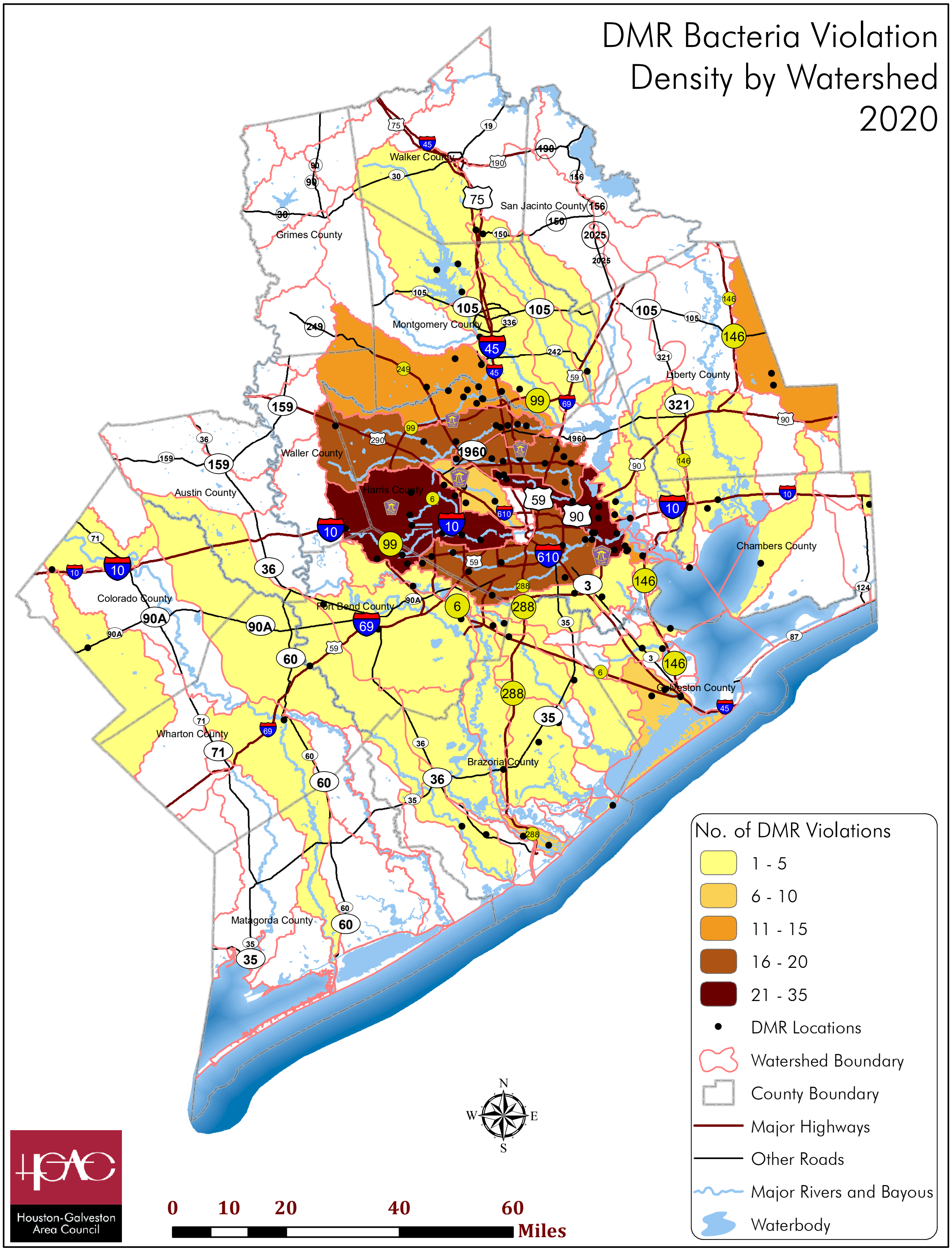
MAP 7: DMR Bacteria Violation Occurrences, 2020

Map 7 shows the occurrences of DMR violations for 2020.



MAP 8: DMR Bacteria Violation Density by Watershed, 2020

Map 8 illustrates the frequency of reported DMR bacteria violations by watershed for 2020. Violations are mapped based on WWTF addresses and service area boundary data. Watersheds with insufficient service area boundary data or no WWTF outfalls are shown in white to indicate an absence of data.



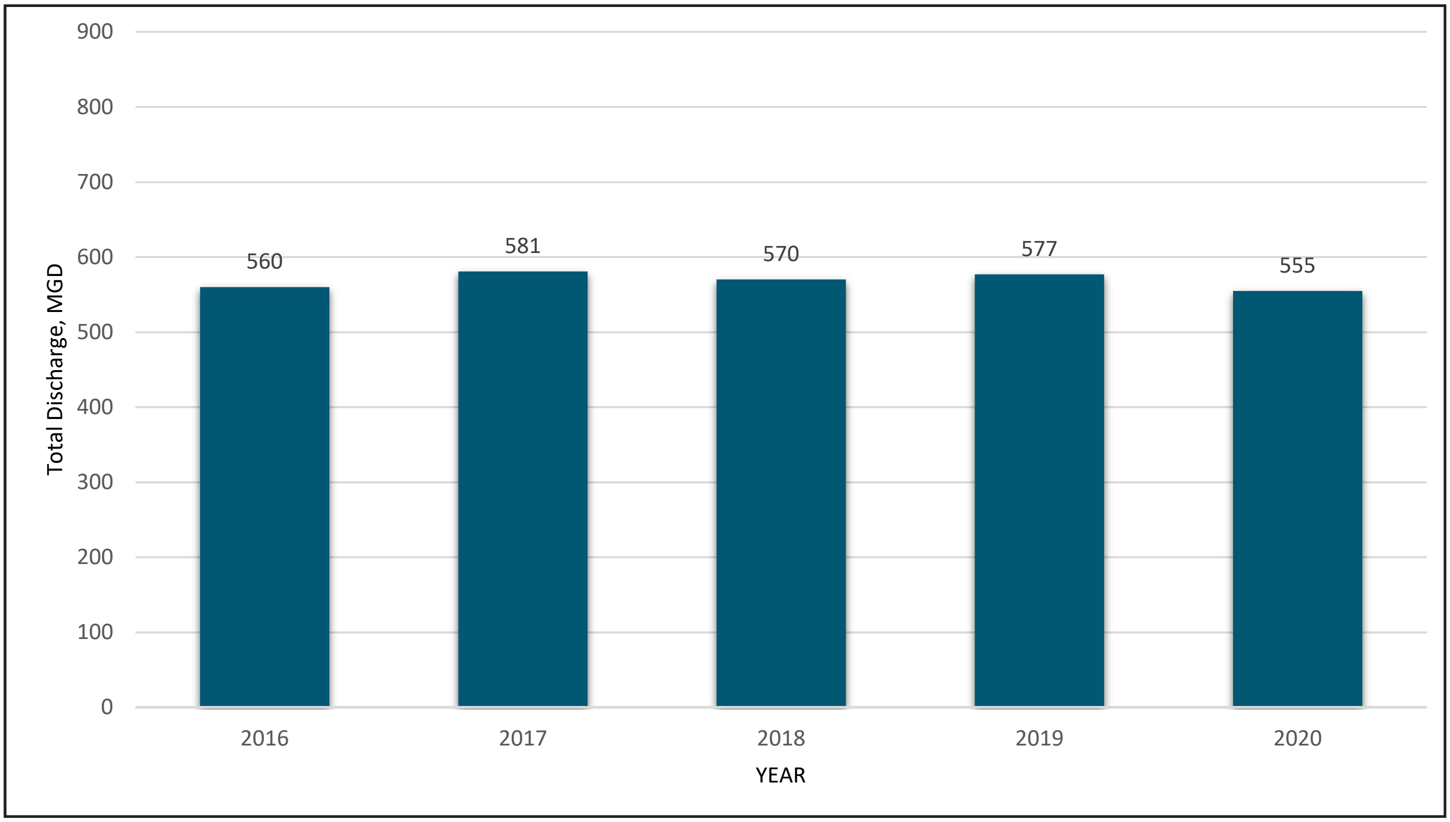
Total WWTF Annual Discharge

The total discharge from domestic WWTFs for each year was calculated based upon the reported average daily discharges as reported in the DMRs. These results, reported in MGD, are shown in Table 12 and Figure 3. For 2020, there was a total reported discharge of 555 MGD.

TABLE 12: Total Reported Discharge (in MGD) from Domestic WWTFs by Year, 2016 - 2020

Discharge	2016	2017	2018	2019	2020
Total Reported Discharge, MGD	560	581	570	577	555

FIGURE 3: Total Reported Discharge (in MGD) from Domestic WWTFs by Year, 2016 - 2020



SANITARY SEWER OVERFLOW DATA ANALYSIS

What is a Sanitary Sewer Overflow?

A Sanitary Sewer Overflow, or SSO, is defined as any type of unauthorized discharge of untreated or partially treated wastewater from a collection system or its components (e.g., manholes, lift stations, cleanouts, etc.) before reaching a treatment facility. Issues such as blockages, significant inflow and infiltration (I&I) of excess water flowing into sewer pipes from sotrmwater (inflow) or groundwater (infiltration), poor operation and maintenance, or inadequate capacity to collect, store, or treat the wastewater can result in SSOs.

Unlike treated WWTF effluent, SSOs represent a high, if episodic, risk because they can have bacterial concentrations several orders of magnitude higher than treated sewage. Untreated sewage can contain large volumes of raw fecal matter, making areas with sizable and/or chronic SSO issues a significant human health risk under certain conditions.

SSOs are self-reported to the TCEQ, with each event linked to the water quality permit number for the facility or subscriber reporting the violation. A permitted facility may be a municipality, municipal water district, private individual, or company. A subscriber system is a sewer system that conveys flow to a wastewater treatment facility that is owned by a separate entity. The term is not intended to indicate individual private laterals, such as a homeowner's connection to a sewer system.

As specified in 30 TAC § 327.32(c), permitted facilities are required to report SSOs to TCEQ within 24-hours of becoming aware of the event, and provide a written notification within 5 days. A monthly summary is also required. Exceptions are made for accidental discharges of less than1000 gallons, which only have to be reported monthly provided they are controlled or removed before entering a water way or adversely affecting a source of public or private drinking water. Information reported must include (at a minimum) the location, volume, and content of the discharge, a description of the discharge and its cause, dates and times of the discharge, and steps taken to reduce, eliminate, and prevent recurrence of the discharge.

Sanitary Sewer Overflow Data Analysis Methods

This evaluation considered TCEQ SSO violation data for the period of 1/1/20 - 12/31/20. Statewide SSO data were acquired from TCEQ on 3/8/21. Analysis included an overview of the total number of permittees reporting SSOs, the cause of SSOs, and the estimated overflow volume by cause.

SSO volumes are self-reported estimates based on visual observations or estimated calculations. Therefore, the values reported can be subjective based on the best professional judgment of the individual reporting the event. Additionally, it is possible that SSOs may go undetected in certain conditions and are therefore not documented or reported to the TCEQ. However, self-reported SSO violation reports are the most comprehensive source of data that can be used to evaluate SSO events and their potential impact to regional water quality.

The frequency of SSO violations by watershed was also evaluated and mapped for this project. Violations were mapped based on the service area boundary linked to each WWTF reporting the event. Service area boundary data was acquired through municipality, private utility, and public municipal utility district (MUD) records. Service area boundaries are updated on an annual basis to reflect things like collection system expansions and other changes or updates. However, spatial analysis of SSOs is limited due to unavailable or unusable service area boundary information. Private utilities in smaller communities, for example, may not maintain usable records of their service area boundaries while service area boundaries do not exist for most package facilities, industrial WWTFs, and other subscribers.

Additionally, due to inconsistent reporting of SSO event addresses and location data, frequency maps were generated using the address of the WWTF itself rather than the location of the SSO event. Therefore, watersheds with insufficient service area boundary data or no WWTF located within its boundaries may be mapped as having no data (as is done in Map 10) even if SSO events were common in those areas.

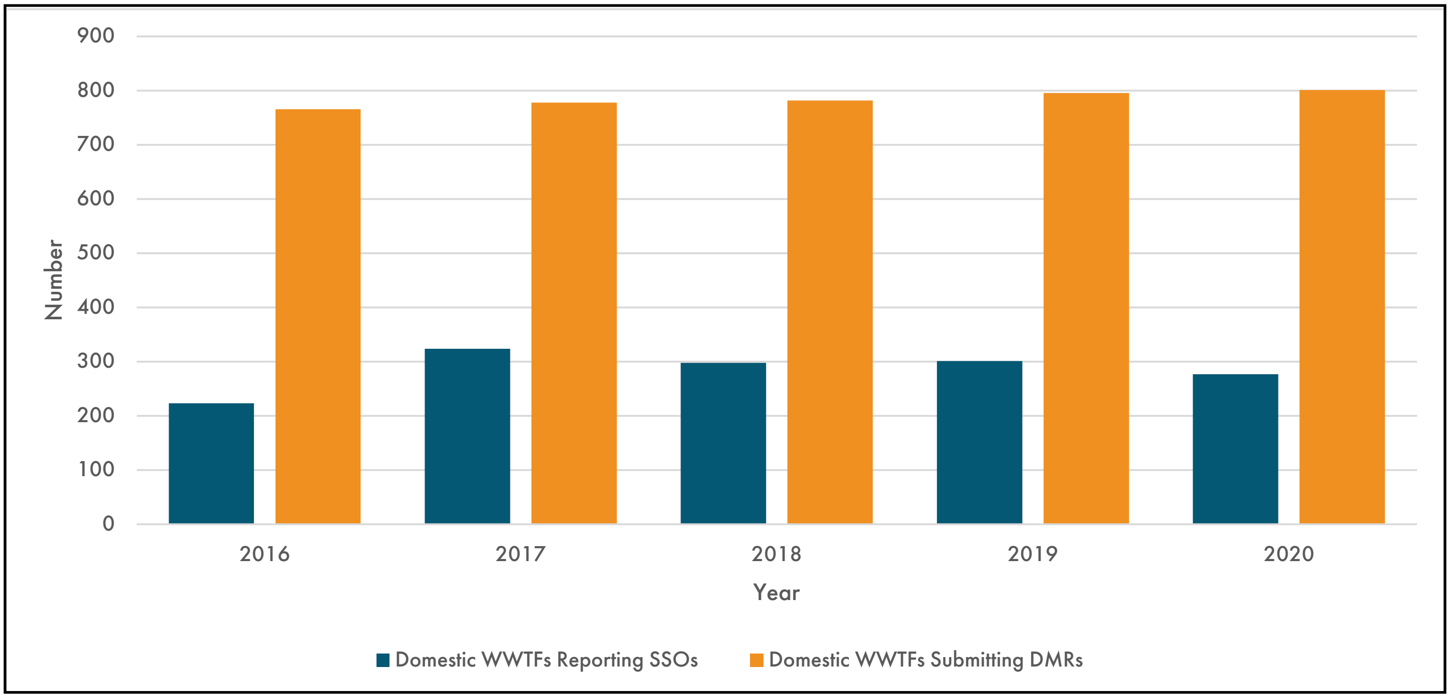
Domestic Permittees Reporting Sanitary Sewer Overflows

H-GAC evaluated the number of domestic permittees submitting SSO violation reports by year compared to the number of permittees in the region submitting Discharge Monitoring Report data. Based on these data, SSO violations are being reported by approximately 35 percent of the domestic WWTFs within the region. The number of domestic WWTFs submitting DMRs and reporting SSOs for the period of 2016 — 2020 are presented in Table 13 and Figure 4.

TABLE 13: Domestic WWTFs Submitting DMRs and Reporting SSOs Each Year, 2016 - 2020

Year	Domestic WWTFs Reporting SSOs	Domestic WWTFs Submitting DMRs
2016	223	766
2017	324	778
2018	298	782
2019	301	796
2020	277	801

FIGURE 4: Domestic WWTFs Submitting DMRs and Reporting SSOs Each Year, 2016 - 2020



Number and Volume of Sanitary Sewer Overflows

The total number of SSO violations and the estimated flow volume for the region was calculated based upon the self-reported data. This information is presented in Table 14.

TABLE 14: Reported SSOs and Estimated Discharge Volume, 2020

Year	Number of SSOs Reported	Estimated Volume (Thousand Gallons)
2020	2,362	8,795

In 2020, there were 2,362 events reported in the data provided by TCEQ. The total volume for these events was 8,795,000 gallons. In calculating the SSO data for 2020, one SSO event of approximately 40,000,000 gallons of treated wastewater was identified. This event, which was caused by a line break, was eliminated from the SSO calculations because its excessive volume skewed the results. Because the discharge was of treated wastewater, it was expected to meet effluent permit limits and therefore not be a significant contributor of bacteria.

Causes of Sanitary Sewer Overflows

In order to determine the primary causes of SSO events, the number of SSO events by reported SSO cause (as reported to TCEQ by the permittees) was calculated. It should be noted, however, that categorization depends on the accuracy of the data reported by the permittees and that while a single cause is listed on the SSO report, many SSOs are caused by a combination of factors. For example, fats/oils/grease (FOG) collecting in lift station pumps can cause overflows in high rain events when excess water is in the system. The event may be listed as lift station failure, but FOG and inflow and infiltration (I&I) of stormwater were both causative elements in this example.

In reviewing the data, H-GAC evaluated not only the listed cause, but also the comments associated with the event to determine if a different cause was more appropriate. For example, if the cause was listed as Equipment Failure but the equipment failed due to a power failure, then the cause was changed to Power Outage for this analysis. If the cause was listed as inflow and infiltration but a blockage by grease was mentioned in the comments field, the cause of the SSO was changed to blockage (grease), as the blockage would have caused the infiltrating stormwater to backup and overflow.

Table 15 shows the number of SSOs for 2020 by reported cause and the volume of discharge (in thousands of gallons) for each reported cause. The most common cause listed for reported SSOs in 2020 is Line Blockages (Grease) with 954 events reported for this source. Combined with the 521 non-grease line blockages, line blockages of all types represent 1,475 SSO events (62.4% of the total number of events). The reported source with the largest volume of discharge was I&I, at approximately 5,618,000 gallons. With the amount, frequency, and duration of rainfall events in the Houston-Galveston region, this is not surprising.

As stated earlier, it must be pointed out that many of these SSO events are due to multiple causes and are reported as a single cause based upon the best professional judgment of the person reporting the SSO. Additionally, because of the uncertainty and variability of estimating discharge from these events, volumes reported should only be considered to be estimates.

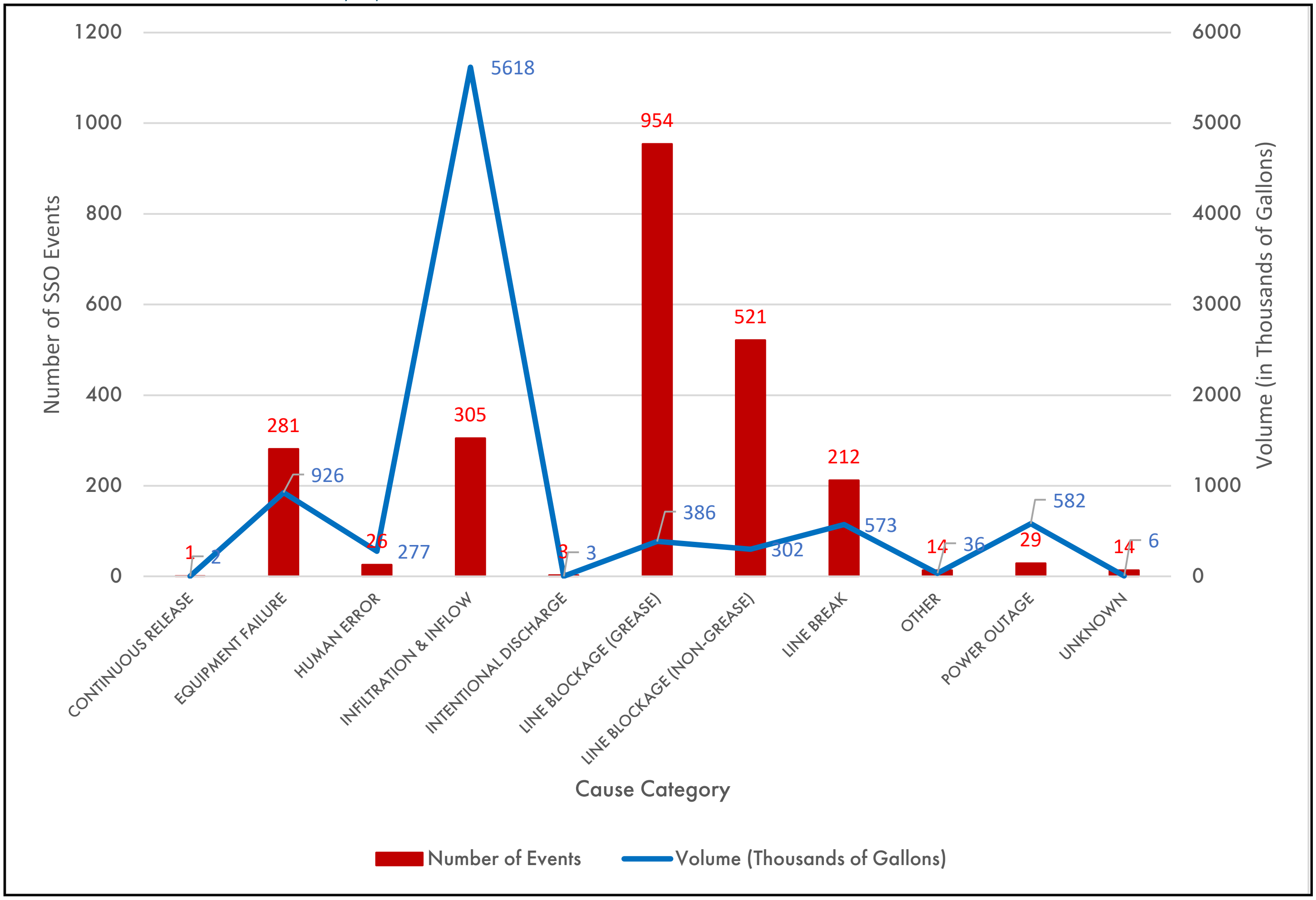
TABLE 15: Number and Volume of Reported SSOs, 2020

Reported Cause	Number of SSO Events	Volume (X1000 gallons)
Continuous Release	1	2
Equipment Failure	281	926
Human Error	26	277
Infiltration & Inflow	305	5,618
Intentional Discharge	3	3
Line Blockage (Grease)	954	386
Line Blockage (Non-Grease)	521	302
Line Break	212	573
Other	14	36
Power Outage	29	582
Unknown	14	6
Vandalism	2	84
TOTAL	**2,362**	**8,795**

PHOTO: Sanitary Sewer Overflow

Figure 5 shows the number and volume of SSO events by reported cause category.

FIGURE 5: Number and Volume of SSO Events by Reported Cause, 2020

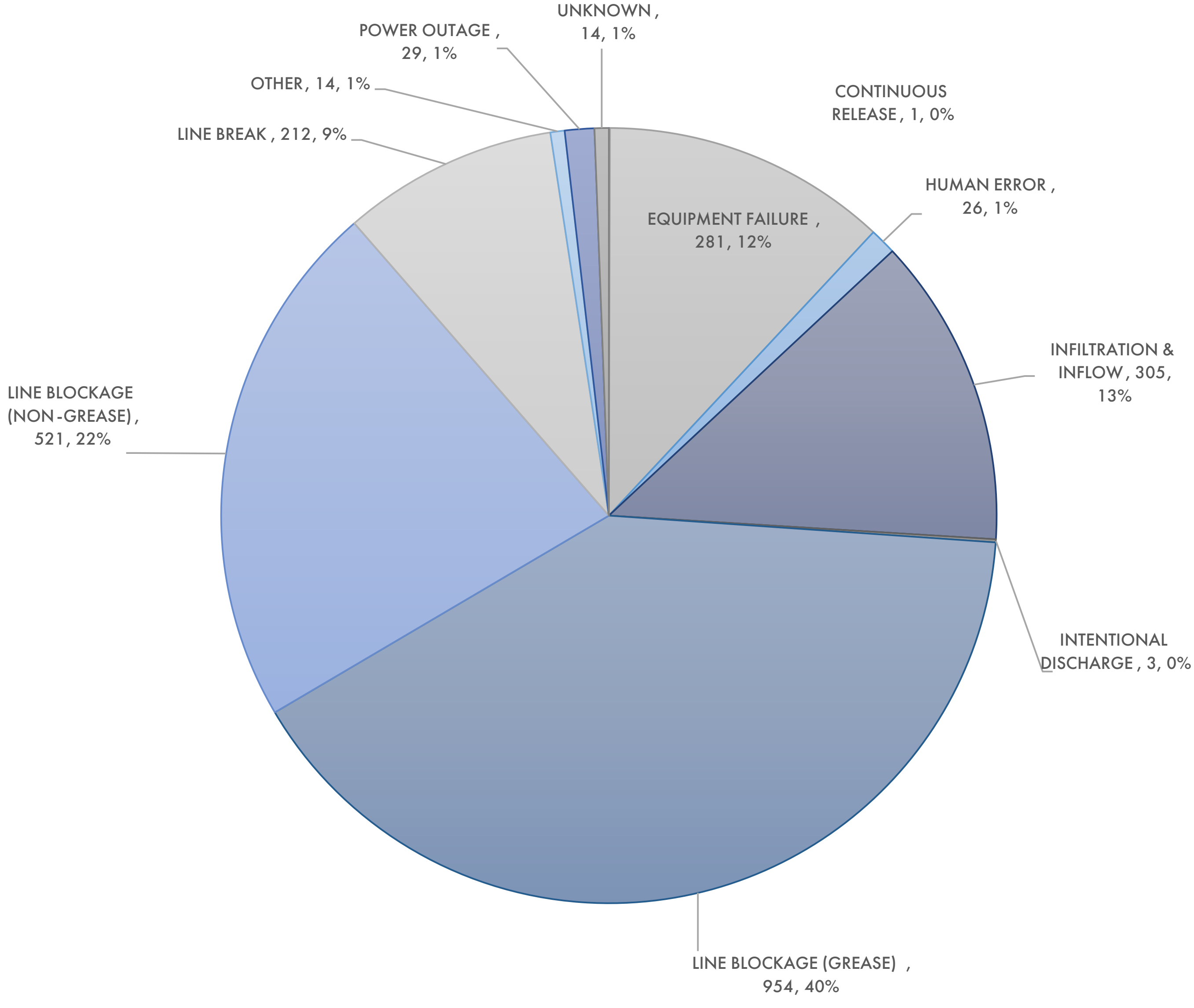


As noted earlier, Line Blockage (Grease) is the most commonly reported source of SSOs, with I&I having the largest volume of discharge.

Line Blockages (Grease) account for 40% of the reported SSO events, with Line Blockages (Non-Grease) accounting for 22% of SSO events. Non-Grease Blockages include those caused by rags, debris, roots, and other sources. Together, these blockages make up 62% of the total number of reported events. Inflow & Infiltration is the next largest source, at 13%. Once again, it is important to consider that SSO events are typically due to a multitude of causes, such as I&I backing up due to a line blockage or equipment failing due to a power failure. These events are listed as reported by the permittee based upon their best professional judgment but may not present a true and accurate accounting of these events due to limitations in the reporting system. More specifically, the reporting system allows for only one cause to be listed.

Figure 6 shows the reported cause categories as a percentage of the total number of SSO events (N = 2,362).

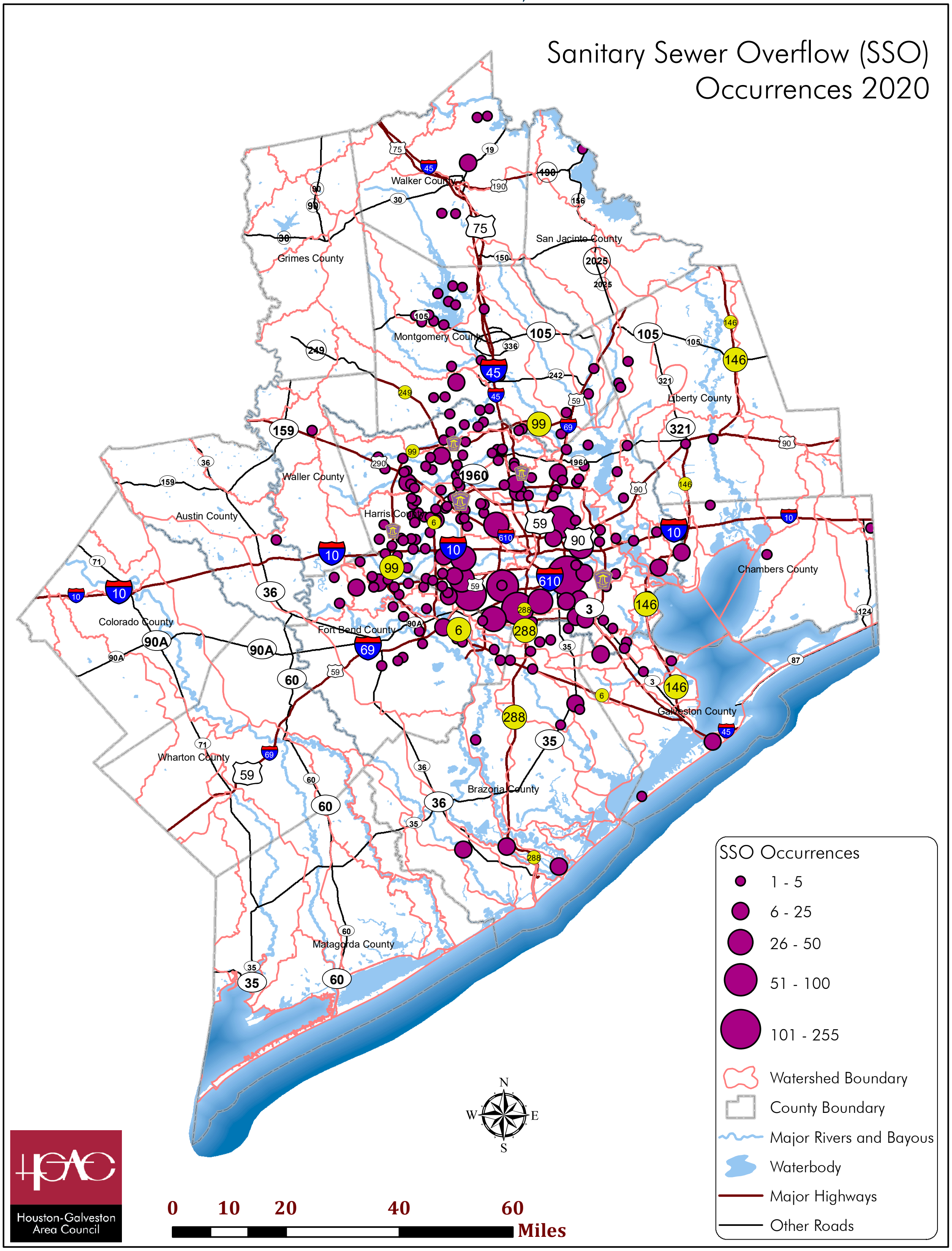
FIGURE 6: Categories of Reported SSO Events by Percentage, 2020



Locations of Sanitary Sewer Overflow Occurrences

Map 9 shows the spatial representation of occurrences of reported SSOs for 2020.

MAP 9: SSO Occurrences, 2020



Frequency of Sanitary Sewer Overflows by Watershed

Map 10 illustrates the frequency of reported SSOs by watershed. SSO events are mapped based on WWTF addresses and service area boundary data. Watersheds with insufficient service area boundary data or no WWTF outfalls are shown in whiet to indicate an absence of data.

MAP 10: SSO Frequencies, 2020

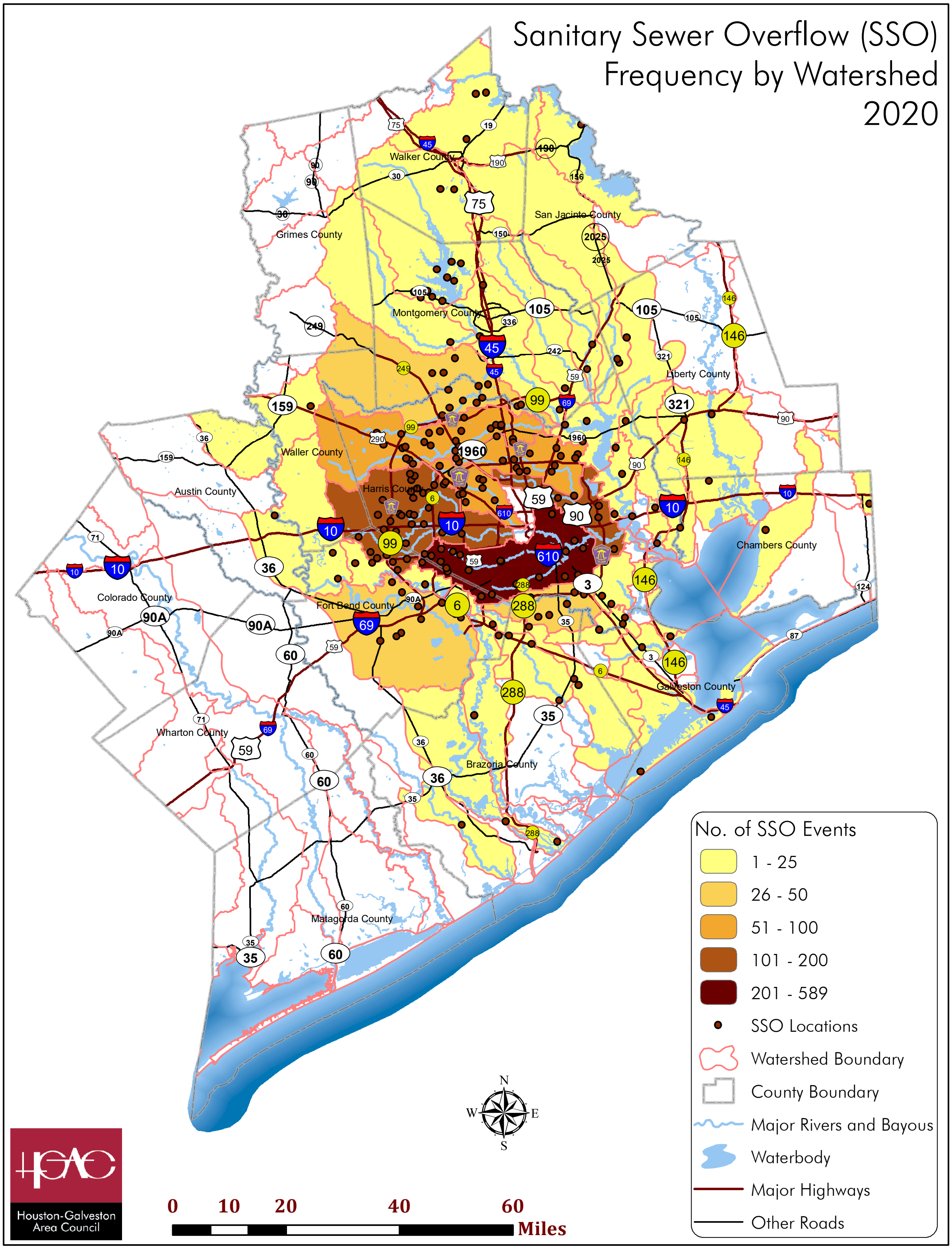


PHOTO: Sanitary Sewer Overflow

Based on the locations of reported SSOs, the more populated urban and suburban watersheds throughout the region are experiencing higher rates of SSO events compared to the more rural, smaller communities along the outer perimeter of the region. However, it should be noted that some rural communities with small WWTFs and package facilities may be underrepresented due to staff and resource limitations resulting in a greater likelihood of SSOs going undetected. Regardless, it is expected that developed areas experience more frequent SSO events due to larger populations putting added strain on the collection systems overall, including contributing FOG to the collection system, resulting in a greater frequency of blockages. Also, the amount of impervious cover in urban areas may make SSOs more visibly identifiable, as rural systems may have long runs of pipe between connections or running though undeveloped areas where they may go unseen. Also to be considered is the age of the infrastructure, as older systems will be more likely to experience structural failures such as line breaks.

City of Houston Sanitary Sewer Overflow Tracking

Sanitary Sewer Overflows are considered a large contributor of indicator bacteria to area streams. Identifying, reporting, and correcting SSOs is a challenge for local governments. Tracking SSO reports over time is an additional challenge for local governments and planning organizations like the BIG, as a lack of consistent and uniform reporting within and across all local jurisdictions poses a problem for analysis and solution generation.

In 2019, the City of Houston initiated the use of a new enterprise resource planning software to manage their inspections and SSO reporting. This software platform allows for a unified database that can track incidents reported through the 3-1-1 service request and inspectors, manage corrective actions taken, and generate analysis and reports.

Inspectors and technicians enter information directly through mobile forms into a database. This software captures:

- Nature of Event (location, cause, volume, source, cause, route, etc.)
- Potential Danger
- Date/Time/Duration
- Steps taken to prevent recurrence and mitigate adverse effects
- Resource usage (man hours, vehicle usage)
- Photo and File attachments
- Associated work orders (repairs, inspections, etc.)

The database software can then be used to generate reports for end users and track future actions. An integrated mapping application allows for the inclusion of pipe routing and other key features.

CONFORMANCE REVIEW FOR CWSRF PROJECTS

In conjunction with H-GAC's role as a regional planning group and the local council of governments for the Houston-Galveston area of the Upper Gulf Coast, staff regularly provides comments on grant proposals of varying types. For the WQMP Update, H-GAC reviews proposals for projects under the Texas Water Development Board's (TWDB) Clean Water State Revolving Fund (CWSRF) program. These reviews help ensure regional goals are represented in project funding decisions at a variety of governmental levels.

Entities with wastewater treatment facility and transport infrastructure make loan applications to TWDB to assist in the cost of improvements. These applications are reviewed by TCEQ. If requested by TCEQ, H-GAC also completes a review to determine if the applicant has conformed to the regional water quality management plan. H-GAC reviews the grant application and associated engineering documentation (such as the Preliminary Engineering Report, Environmental Review, population projections, etc.) for concurrence with broad regional planning priorities and goals (such as improving water quality, protecting waterways, reducing bacteria or nutrient loading, etc.).

During this review process, H-GAC staff looks for:

- Population projections that match TWDB, H-GAC, or other relevant forecasts;
- Alternatives that may impact water quality considerations; and
- Concurrence with regional priorities and goals (water quality impacts, etc.)

As part of this Project, H-GAC staff used data gathered under this and previous projects to review and provide comments on one CWSRF project application during the FY 21 WQMP Update period. The outcome of that review is shown in Table 16. The CWSRF project reviewed during this year was consistent with regional goals of the WQMP.

TABLE 16: Clean Water State Revolving Fund Application Review

Project ID	Requesting Entity	Project Summary	Findings
73896	City of Bay City	This project includes structural improvements, process/mechanical improvements, electrical and instrumentation/control improvements, and infrastructure improvements to the Bay City Wastewater Treatment Facility.	The goals of the project are consistent with regional goals as defined in the WQMP.

SUPPORT WATERSHED PLANNING

The goal of this Task is to support watershed planning in the Houston-Galveston Region and to support regional information sharing on water quality and related topics. Work performed under this task includes:

- Coordination of water quality planning efforts with flood mitigation, resilience, and habitat conservation processes in areas with existing watershed protection plans
- Facilitation of the Natural Resources Advisory Committee (NRAC)
- Urban Forestry support and coordination
- Support for watershed-based plans that are not covered under other contracts.

Coordination of Water Quality Planning Efforts

WQMP project staff work closely with other H-GAC staff in the development of watershed-based plans, including Total Maximum Daily Loads and watershed protection plans. Data acquired and analyzed under this project are used to inform decisions for these other watershed projects.

Typically, H-GAC facilitates meetings for the San Bernard River watershed and the Cedar Bayou watershed. Unfortunately, we were unable to meet during this project year due to social distancing requirements related to COVID-19.

Facilitation of the Natural Resources Advisory Committee

As an extension of H-GAC's role as a coordinator of regional planning efforts, H-GAC staff members develop and maintain relationships with other local and state governments, community groups, and other organizations involved in efforts related to the aims of this Project. Through this task, H-GAC provides staff for the quarterly NRAC meeting to address regional watershed management and related natural resource issues. The NRAC provides policy recommendations for H-GAC's Board of Directors and serves as a regional roundtable for coordinating environmental efforts. This committee provides an efficient communication network and point of contact for H-GAC staff with other local and regional water quality decision makers.

Four NRAC meetings were held during the Project term. Topics discussed at these meetings are presented in Table 17.

TABLE 17: Natural Resources Advisory Committee Meetings, FY 20

Date	Topics Discussed
11/05/20	• Appointment of new members • Appointment of leadership • Environmental Committee Highlights • Environmental Program Highlights • Regional Conservation Framework • Parks & Natural Areas Subcommittee Report • WISE Awards Subcommittee Report
02/04/21	• Environmental Committee Highlights • Environmental Program Highlights • Parks & Natural Areas Subcommittee Report • WISE Awards Subcommittee Report
05/06/21	• Environmental Committee Highlights • Environmental Program Highlights • Parks & Natural Areas Subcommittee Report • WISE Awards Subcommittee Report • Bylaws Subcommittee Report • Partnership in Litter Abatement Presentation
08/05/21	• Environmental Committee Highlights • Environmental Program Highlights • Parks & Natural Areas Subcommittee Report • WISE Awards Subcommittee Report • Bylaws Subcommittee Report • Water Quality Management Plan Presentation

Support for Watershed-Based Plans

H-GAC staff routinely attend meetings of, or otherwise support, numerous other organizations involved in water quality efforts throughout the region. Due to the density of work in the Houston-Galveston Region, coordination and communication is essential. During the current project term, staff helped coordinate activities on several projects with a variety of internal programs and outside organizations. Examples of the groups and projects staff worked with this year include:

Galveston Bay Estuary Program (GBEP) subcommittee memberships (Water and Sediment, Monitoring and Research) and leadership (Water and Sediment – Vice Chair);

Coordination with the Clean Rivers Program on the development of the Basin Summary Report;

Promotion of OSSF projects, including the Supplemental Environmental Project for the Homeowner Wastewater Assistance Program;

A variety of interactions with state and local policy and regulatory efforts (including coordination with ongoing TMDL, WPP, and other efforts). Noteworthy watershed-based projects include:

- Bacteria Implementation Group (BIG)
- San Jacinto-Brazos Coastal Basin TMDL
- Brazos-Colorado Coastal Basin TMDL
- Upper Oyster Creek TMDL
- East Fork San Jacinto River TMDL
- West Fork San Jacinto River WPP
- Big Creek TMDL
- Cedar Bayou WPP
- Bastrop Bayou WPP
- San Bernard River WPP
- Cypress Creek WPP
- Spring Creek WPP

In addition to facilitating regional communication, coordination, and cooperation on water quality efforts through staff presence and participation, H-GAC uses the data generated under the Project to support various internal and external project needs.

Urban Forestry Support and Coordination

Through the Urban Forestry Support and Coordination subtask, H-GAC supports regional efforts to coordinate water quality and forestry efforts, with a focus on riparian and urban areas. H-GAC supports the Texas Forest Service and other forestry agents in facilitating events and efforts in the H-GAC region, including participation in the Houston Area Urban Forestry Council, participation on the planning team for the Texas Forests and Drinking Water Partnership, and support in providing data resources and information on funding resources to local forestry partners.

Support for Urban Forestry issues has become a major focus for H-GAC in recent years. As part of these activities, H-GAC staff works regularly with various entities, such as Houston Wilderness, The Nature Conservancy, and Trees for Houston, to provide data for urban forest research projects.

Major urban forestry milestones for this project year include:

<u>Committee Memberships</u>

- Served on local tree planning efforts including The Houston Tree Strategy Implementation Group, The Bayou Preservation Stream Corridor Restoration Committee, and Houston Conservation Moonshot project

- Served in a leadership/steering committee role on The Texas Forests and Drinking Water Partnership (Steering Committee, meetings) and The Houston Area Urban Forestry Council (Board member, meetings)

<u>Presentations</u>

- Presented to a national USDA US Forest Service webinar on the use of forestry data in real world urban forests projects in Houston

- Presented to the Regional Flood Management Committee

Project Planning

- Worked with Texas A&M Forest Service and other local partners to develop a corporate sustainability partnership project to identify and fund tree plantings in riparian areas in Houston. The team did aerial surveys, field visits, and secured 10,000 trees for an initial planting(s) as a model for expanding the project in impaired watersheds in the Houston area.

- Directly supported the City of Houston in developing two large-scale grant applications related to urban forestry; one to update their existing Parks Master Plan to incorporate greater riparian forestry and related efforts, and one to develop a legacy tree program for propagation of native tree stock.

- Met with various stakeholders to develop or support potential urban forestry partnerships, including the West Houston Association, Houston Headwaters to Baywaters, the Native Plant Society of Texas, and the Katy Prairie Conservancy.

- Worked with Texas A&M Forestry Water Resources staff to pursue grant opportunities from private industry to link corporate funding of tree projects to water quality benefits.

- Worked with EPA and the US Army Corps of Engineers to develop forestry data and assumptions for a water quality/water quantity modeling effort (WMOST) for Cypress Creek.

- Represented the Houston area in the national Forests in Cities project, including development of a publication (not yet published) and contribution to online articles.

- Worked with Texas A&M Forestry Water Resources staff to include forestry elements in the Cypress Creek WPP

- Coordinated with H-GAC projects with related aims, Including the Spring Creek, Cypress Creek, West Fork San Jacinto River, and Clear Creek Watershed Protection Plans, The Regional Conservation Framework, and the Regional Flood Management Committee.

PHOTO: Memorial Park

Public Support for TMDL Projects in the Houston Area

As part of this project, H-GAC provided support for public outreach activities for completed TMDL projects and other TMDL projects being developed in the region, including activities necessary to plan and conduct meetings. Projects included under this subtask include the BIG, Upper Oyster Creek, and Chocolate Bayou (see Map 11). Please note that the BIG TMDL project area overlaps with several of the WPP and other TMDL projects.

MAP 11: Watershed-Based Plans in the Houston-Galveston Region

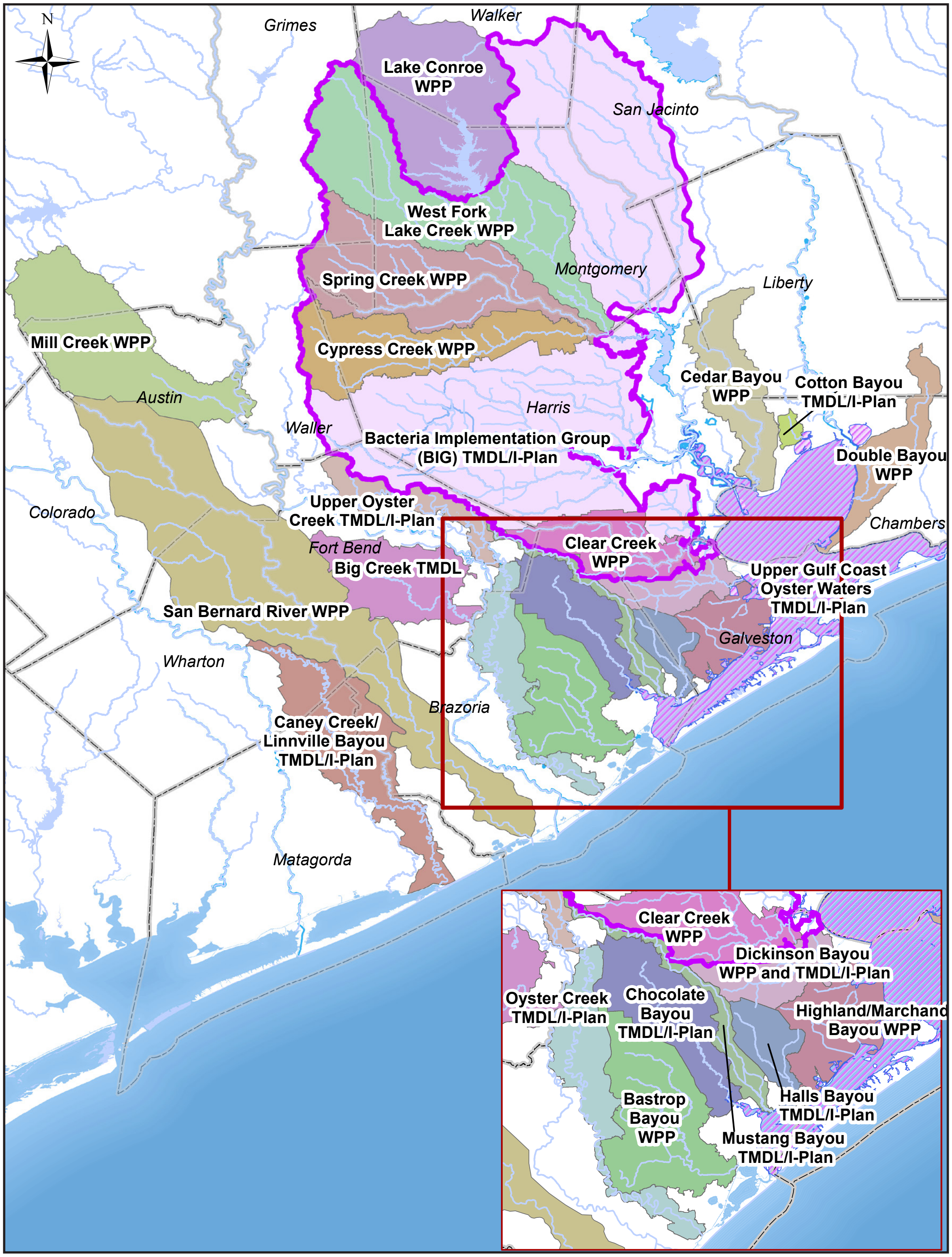


PHOTO: Installation of a new aerobic treatment unit

OSSF PLANNING, COORDINATION, AND SUPPORT ACTIVITIES

The planning, coordination, and support for H-GAC's various on-site sewage facility program activities are conducted under the Water Quality Management Plan project.. These activities include maintaining and continuing to develop H-GAC's existing spatial database of permitted OSSFs and projected/estimated unpermitted OSSF locations to support regional water quality and wastewater infrastructure projects, administration of H-GAC's Supplemental Environmental Project (SEP) to identify failing OSSFs eligible for repair and replacement within the Region, and outreach and education programs.

The primary subtasks under this objective are:

- Permitted OSSF Update
- Unpermitted OSSF Update
- Coordination and Outreach to Authorized Agents
- Supplemental Environmental Program Administration and Coordination
- OSSF Outreach and Education

Decentralized on-site sewage facilities are a widespread wastewater treatment technology in the Region. OSSFs are relied on for the treatment and disposal of wastewater in areas not conducive to centralized sanitary sewer service. Although they produce treated effluent of a high grade when functioning properly, OSSFs can be appreciable sources of bacterial contamination if they are not properly maintained and functioning. Annually, thousands of OSSFs are designed, sited, permitted, and installed within the Region, especially in the rapidly developing unincorporated areas of northern Harris and Montgomery counties, as well as the rural counties along the Region's outer boundary. While new systems are subject to permit requirements as specified in Title 30 Texas Administrative Code Chapter 285 (30 TAC §285), many systems installed before 1989 did not require a permit. Specific locations of these unpermitted systems may be unknown. Information regarding these unpermitted systems is particularly significant because, as discussed below, they represent a majority of all OSSFs in the H-GAC service area.

TCEQ has authority over the regulation and permitting of OSSFs in Texas. In many cases, that authority is delegated by TCEQ to Authorized Agents (counties, municipalities, river authorities, and other responsible entities). As there is no centralized repository for OSSF permitting data, the Authorized Agents have traditionally maintained these data in a variety of formats. To ensure a regional, uniform set of data for use by Authorized Agents and water quality planning efforts, H-GAC developed a comprehensive inventory of permitted system locations and likely unpermitted system locations under previous grant contracts. During this Project year, new data provided by the Authorized Agents were added to H-GAC's regional OSSF permit database.

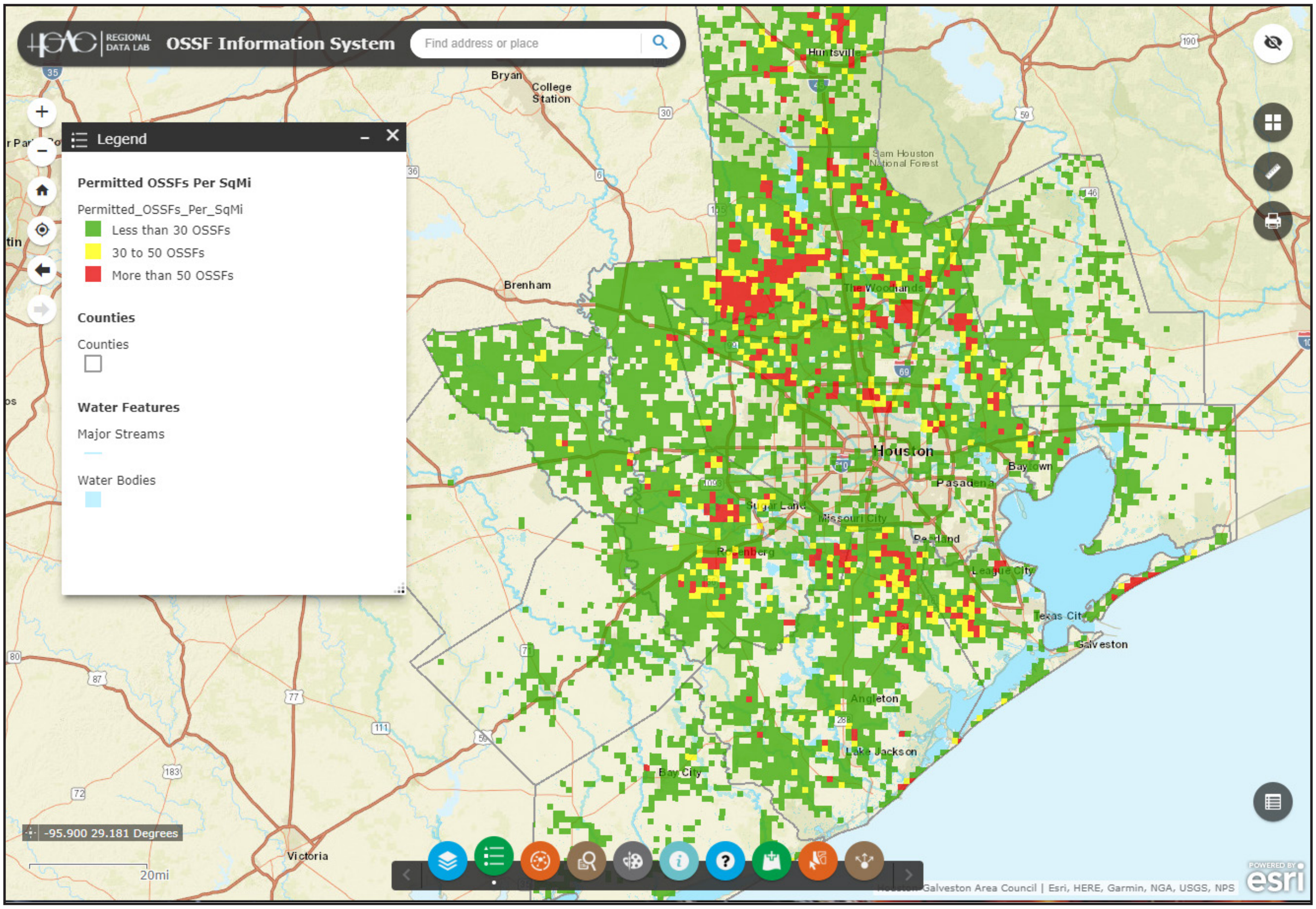
PHOTO: Decommissioning of a conventional septic system

PHOTO: Surfacing sewage from a failed on-site sewage system

Permitted OSSF Update

For the Permitted OSSF Update, H-GAC staff continued to update the OSSF location database with data from Authorized Agents, including permitted OSSF locations and related permit data as appropriate. The intent of the OSSF database is to provide a comprehensive, spatially-explicit inventory for all permitted OSSF locations throughout the region. No such inventory existed prior to the initiation of H-GAC's initial database development. The initial work had collected location data for permitted OSSFs and developed a program under which participating Authorized Agents would submit new system data on a regular basis, including spatial locations using Global Positioning System (GPS) units provided by H-GAC. This information is updated regularly and is available to the public through H-GAC's OSSF Information System (https://datalab.h-gac.com/OSSF/). This interactive OSSF mapping tool (Figure 7) allows the user to view the locations of permitted OSSFs by age, Authorized Agent or permitting authority, number of permits per square mile, and likely locations for old or unpermitted OSSFs.

FIGURE 7: H-GAC's OSSF Information System



Authorized Agents typically submit data to H-GAC in electronic format. Data received from Authorized Agents are reviewed by H-GAC staff and reformatted as necessary for inclusion into the geospatial database. The methods employed in the update of the OSSF database are described in further detail in the *H-GAC Water Quality Management Plan Data Acquisition and Geospatial Data Quality Assurance Project Plan*. Any data errors (incorrect GPS coordinates, typographical errors, etc.) were corrected, while duplicate records were removed.

This update, performed annually, brings the database current through the end of calendar year 2020. There were a total of 4,638 permitted systems added to the database for 2020. As of December 31, 2020, there are a total of 111,021 permitted OSSFs in the database. Austin, Colorado, Liberty, and Walker counties did not report any data to H-GAC for 2020. Table 18 shows a breakdown of the number of permitted systems by county. Map 12 shows the permitted systems in the region. Map 13 shows the concentrations of permitted OSSFs by county. Appendix C shows the location of permitted OSSFs by watershed.

TABLE 18: Permitted OSSFs by County

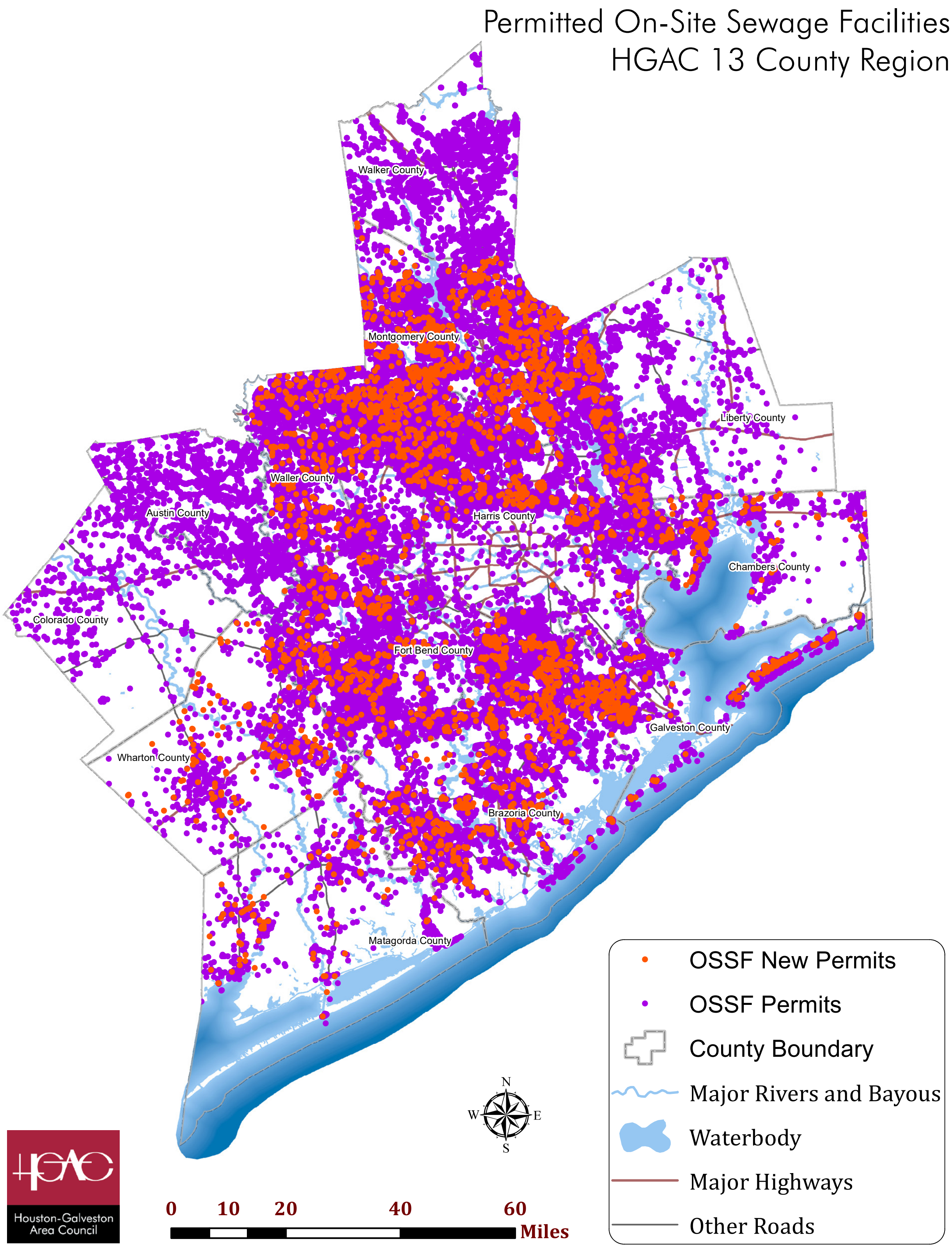
County	New Systems (2020)	Total Permitted Systems
Austin	Not Reported	3,178
Brazoria	777	15,363
Chambers	147	1,308
Colorado	Not Reported	595
Fort Bend	433	13,527
Galveston	291	6,333
Harris	750	23,349
Liberty	Not Reported	990
Matagorda	90	1,493
Montgomery	1,653	33,209
Walker	Not Reported	6,043
Waller	312	4,363
Wharton	185	1,270
TOTAL	**4,638**	**111,021**

Table 19 documents data processing notes related to the most recent update, including data corrections.

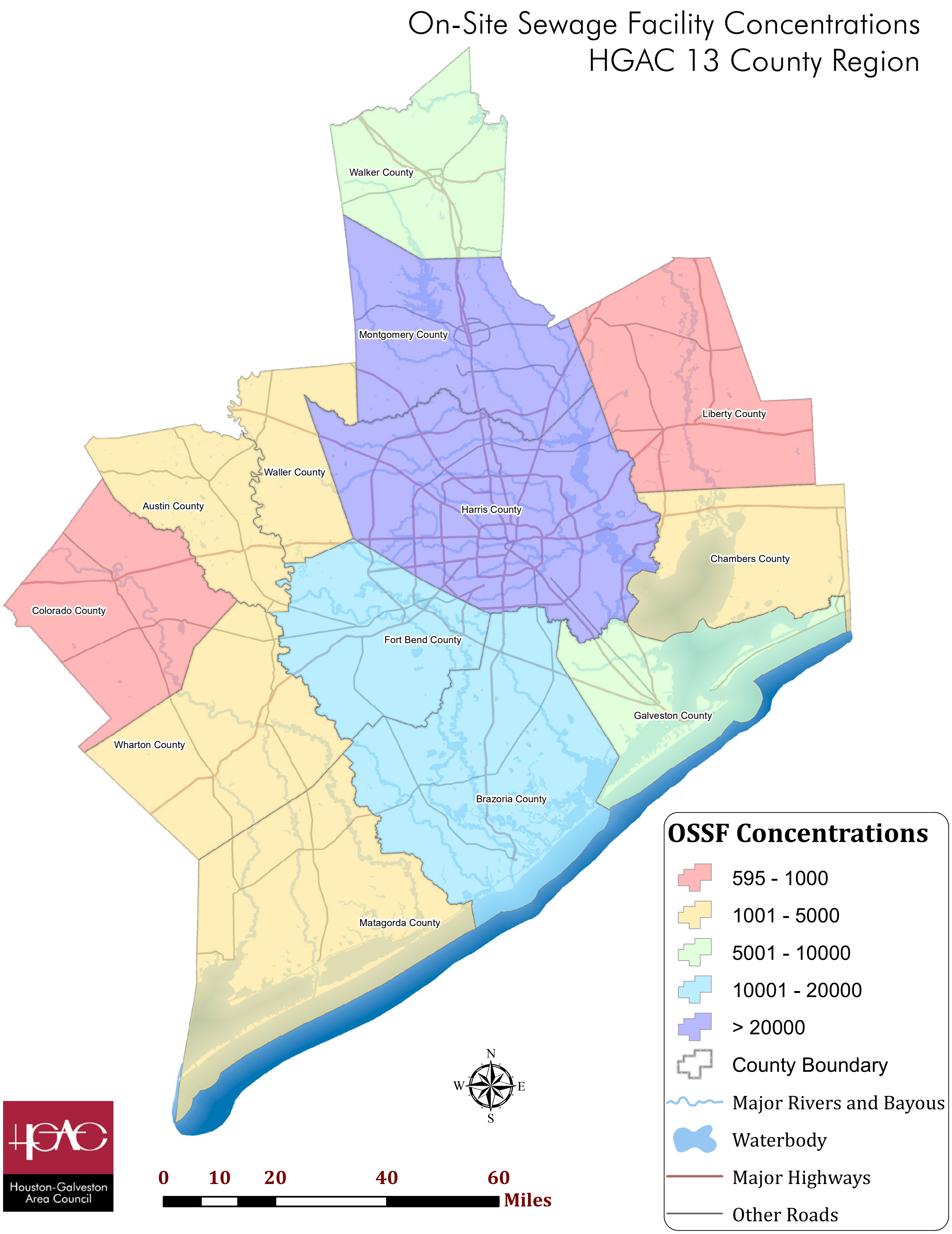
TABLE 19: OSSF Database Update Notes

County or Authorized Agent	Update Notes
Austin	No permit data submitted during the update period.
Brazoria	24 OSSFs reported were not within the Brazoria County boundary and were removed from the database.
Chambers	Did not incorporate 29 entries labeled as "redesigns" as they may create duplicates in the database.
Colorado	No permit data submitted during the update period.
Fort Bend	No records found outside county boundary.
Galveston	No update notes.
Harris	Permit locations were geocoded from property address.
Liberty	No permit data submitted during the update period.
Matagorda	Permit locations were geocoded from property address. 12 OSSFs labeled as "low quality" were corrected via StarMap and Google Earth.
Montgomery	12 OSSFs reported not within county boundary, removed from database.
San Jacinto River Authority	No update notes.
Walker	No permit data submitted during the update period.
Waller	13 OSSFs reported not within county boundary, removed from database.
Wharton	Permit locations were geocoded from property address.
General	Removed an additional 97 records that fell outside the H-GAC 13-county region

MAP 12: Permitted OSSFs in the Houston-Galveston Region



MAP 13: Concentrations of Permitted OSSFs by County



Unpermitted OSSF Update

For the Unpermitted OSSF Update, H-GAC staff evaluated and estimated the probable locations of unpermitted systems, which were typically installed prior to the requirement that OSSFs be permitted. This analysis is performed using polygons representing parcel and census block data.

The OSSF inventory data developed by H-GAC deals specifically with permitted OSSFs. For most Authorized Agents, systems began to be permitted after 1989. OSSFs installed prior to this date were not necessarily required to have a permit (depending on county). These systems are considered to be grandfathered and, in most cases, are not actively tracked unless violation data exist for that site. While many of these systems are well-maintained, aging systems in general pose a greater threat of failure and contamination of groundwater and surface water sources. Many of these older systems may be of a type that is not appropriately suited for the soil type. These unpermitted systems represent an appreciable portion of the systems in service. The OSSF data have already been used for a variety of watershed protection efforts and other local planning projects. With the projected population expansion and aging infrastructure, additional information about unpermitted system locations will be vital to utility planning.

METHODS

H-GAC's methods for the unpermitted analysis were the same as previous project years, in which unpermitted locations were deduced through a comparison of polygons (known parcels/census blocks), known locations of OSSFs, and known sanitary sewer systems service boundary data. Parcels with occupied structures that are located outside of established service areas and do not have a permitted OSSF were assumed to have an unpermitted OSSF. The detailed methodology employed in the unpermitted OSSF analysis is described in the *H-GAC Water Quality Management Plan Data Acquisition and Geospatial Data Quality Assurance Project Plan*.

The Unpermitted OSSF analysis was originally designed to identify the locations of unpermitted OSSFs by tax parcel polygon or census block data. H-GAC has a comprehensive parcel database for a majority of the 13 counties in the H-GAC region. Tax appraisal parcels allow for numeric estimations of unpermitted OSSFs with some limitations. For example, the centroid of the parcel is usually identified as the location of the OSSF. As properties vary in size and shape, the centroid in many cases is not adjacent to the actual system. It is also assumed that there is a 1:1 ratio of OSSFs to parcels. This potentially underestimates the number of OSSFs, as there is typically only one OSSF per parcel for a single-family residency use, but there likely could be more than one system per parcel under certain uses (such as a mobile home community).

For the counties for which H-GAC does not have digitized tax parcels available (Austin, Chambers, Matagorda, Walker, and Wharton), census blocks were used to complete the analysis. However, use of the census blocks is not ideal. Using this methodology, areas containing unpermitted OSSFs could be established, but it is difficult to ascertain a numeric estimation or the exact physical location of systems. A 1:1 ratio is also used for the census blocks to provide a conservative estimate, but it is almost a certainty that there will be multiple households per census block, so the number of OSSFs will be underestimated using census block data.

While parcel and census block data have been extremely useful in identifying potential locations of unpermitted OSSFs, H-GAC will attempt to refine the process in future project years by utilizing the 911 address data set. The QAPP has been revised to allow use of the 911 address points, and H-GAC staff are currently developing the methodology to begin using these data to develop a more accurate and detailed estimation and location of unpermitted systems in future project years.

RESULTS AND OBSERVATIONS

Based upon H-GAC's analysis, there are a combined 199,006 polygons (parcels and census blocks) without permitted OSSFs that do not lie within 2021 service area boundaries. Assuming a 1:1 ratio of OSSFs to polygons and recognizing there are inherent issues with this method that likely underestimates the number of OSSFs, H-GAC conservatively estimates that there are approximately 200,000 unpermitted systems within the region. When combined with the known permitted systems, there are approximately 310,000 OSSFs within the region.

Unpermitted OSSF data are summarized below. Table 20 shows the number and type of polygons without permitted OSSFs by county. Table 21 shows the number of permitted and estimated unpermitted OSSFs by county and the estimated total number of OSSFs in the region. Locations of areas containing unpermitted OSSFs within the region are shown in Map 14.

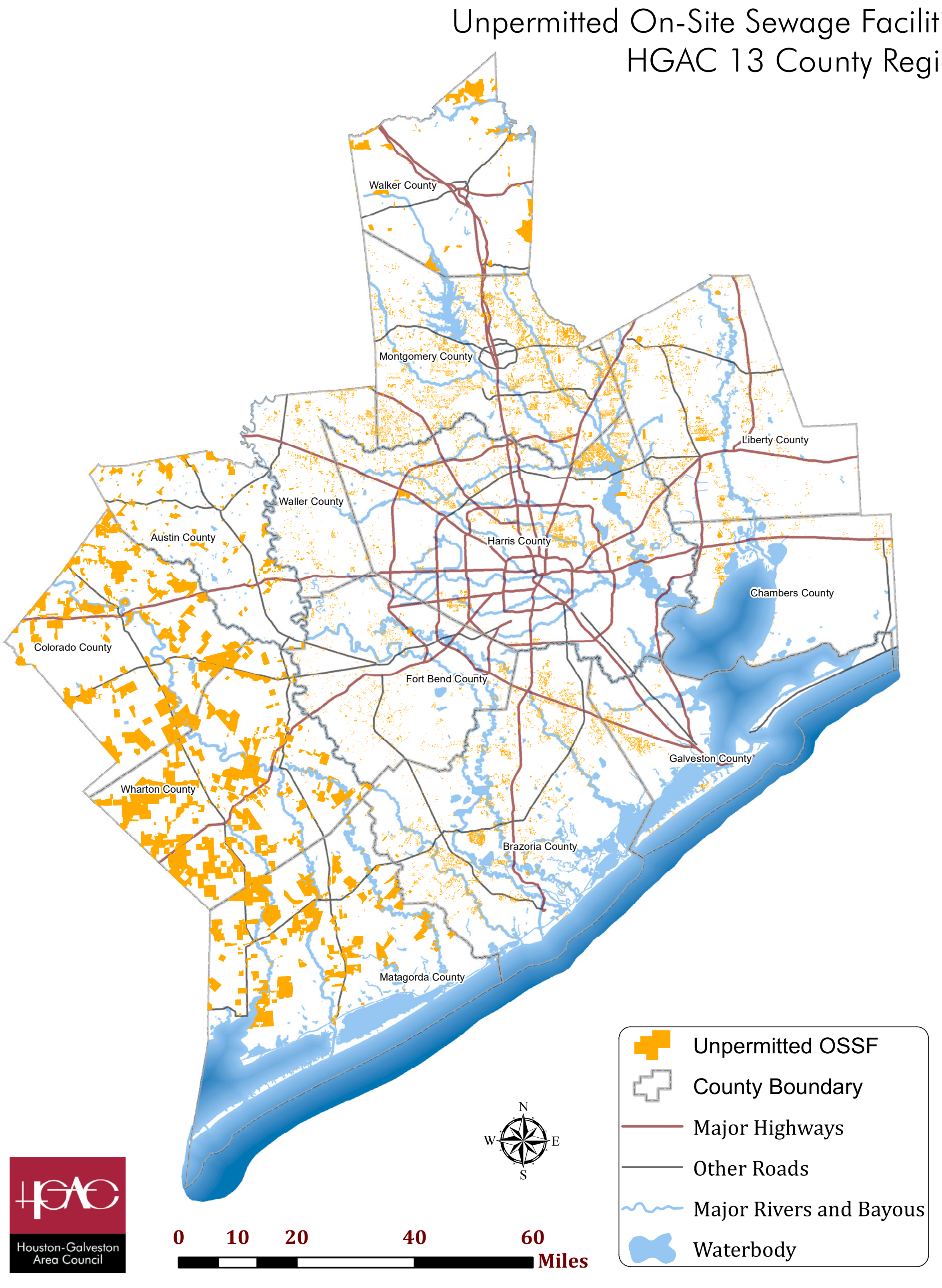
TABLE 20: Number of Polygons Without Permitted OSSFs by County

County	Polygon Source	Polygon Count
Austin	Census Block	209
Brazoria	Parcel	33,521
Chambers	Parcel	5,451
Colorado	Census Block	475
Fort Bend	Parcel	9,421
Galveston	Parcel	5,724
Harris	Parcel	77,584
Liberty	Parcel	11,093
Matagorda	Census Block	392
Montgomery	Parcel	43,377
Walker	Census Block	179
Waller	Parcel	11,029
Wharton	Census Block	551
TOTAL		**199,006**

TABLE 21: Summary of Permitted and Unpermitted OSSFs by County

County	Permitted Systems	Unpermitted Systems	TOTAL
Austin	3,178	209	3,387
Brazoria	15,363	33,521	48,884
Chambers	1,308	5,451	6,759
Colorado	595	475	1,070
Fort Bend	13,527	9,421	22,948
Galveston	6,333	5,724	12,057
Harris	23,349	77,584	100,993
Liberty	990	11,093	12,083
Matagorda	1,493	392	1,885
Montgomery	33,209	43,377	76,586
Walker	6,043	179	6,222
Waller	4,363	11,029	15,392
Wharton	1,270	551	1,821
TOTAL	**111,021**	**199,006**	**310,027**

MAP 14: Unpermitted OSSFs in the Houston-Galveston Region



Coordination and Outreach to Authorized Agents

H-GAC staff works in coordination with Authorized Agents and their Designated Representatives to receive OSSF permit data submissions for inclusion into the regional OSSF database. For counties in the Coastal Zone (Brazoria, Chambers, Galveston, Harris, and Matagorda), H-GAC facilitates data gathering and sharing with Texas A&M AgriLife Extension, who are currently developing a Coastal Zone OSSF database for TCEQ.

Several counties did not submit data for inclusion in this year's OSSF database update, with some not having submitted data in several years. Staff changes at both H-GAC and some of the Authorized Agents have led to the need to meet with those entities' Designated Representatives and reestablish some of the working relationships that have existed in the past. While staff have had discussions with several of the Designated Representatives, further meetings are necessary to resume receiving data from the other permitting authorities.

H-GAC staff reached out to the Designated Representatives for both San Jacinto County and Grimes County. Although both of these counties are outside H-GAC's 13-County area, H-GAC does conduct water quality monitoring in those counties. Additionally, H-GAC is the lead agency on watershed-based plans being developed for water bodies in those counties. Information on OSSF location and density is very important for TMDL implementation or making recommendations in watershed protection plans.

During the project year, H-GAC presented on OSSF topics at two meetings. These meetings are detailed in Table 22. Due to COVID-19 and social distancing restrictions, these meetings were held virtually.

TABLE 22: OSSF Program Coordination and Outreach Meetings, FY 2021

Date	Meeting	Location	Presentation Title
2/4/21	Natural Resources Advisory Committee	Virtual (Regional)	Update on the Homeowner Wastewater Assistance Program Supplemental Environmental Project
4/15/21	Clean Coast Texas Lunch and Learn Series	Virtual (Statewide)	Improving Water Quality Through Coastal Community Programs: H-GAC's Homeowner Wastewater Assistance Program

OSSF Outreach and Education

Through H-GAC's OSSF Outreach and Education programs, staff traditionally conduct or facilitate educational training courses on basic OSSF maintenance and fundamentals of operation. These training courses are offered to homeowners, real estate inspectors and other interested parties as requested.

Homeowner outreach conducted through the SEP is an important component of numerous watershed-based projects. H-GAC uses this program as a vehicle by which homeowners can be educated about the proper operation and maintenance of their systems. Unfortunately, COVID-19 and social distancing restrictions prohibited us from holding in-person classes during this project year.

H-GAC staff has also developed a course for real estate inspectors on how to perform visual inspections of OSSFs for real estate transactions. Because this inspection course requires an in-person training component, H-GAC was unable to hold this course in 2020. H-GAC staff are in the process of reviewing the course materials and resubmitting them to the Texas Real Estate Commission for reauthorization of the course. It is hopeful that H-GAC will be able to resume travel and in-person trainings in the next project year.

Supplemental Environmental Project Coordination and Support

H-GAC is the Third-Party Administrator for a Supplemental Environmental Project (SEP) through the TCEQ (Agreement No. 2012-15). H-GAC's Homeowner Wastewater Assistance Program funds the repair or replacement of malfunctioning or failing OSSFs for homeowners who meet certain income requirements. Funding from this project may also be used to provide extension of first-time sewer service, pump-out service, and water conservation equipment. Homeowners are not charged for any portion of the cost of the work performed.

Funding for the SEP program is provided through voluntary contributions by respondents in a TCEQ enforcement action. These respondents negotiate an agreement to perform a TCEQ-approved SEP to offset a portion of the assessed administrative penalty. In addition to the funding through TCEQ, the Harris County District Attorney's Office also provides funding through their enforcement actions. Homeowners under enforcement for violation of TCEQ rules set forth in 30 TAC § 285 are not eligible for assistance under the TCEQ SEP. However, the additional funding from the Harris County District Attorney's Office does not have that same requirement. Additionally, since Harris County is concerned about water quality on a regional level, their funding is not limited to just Harris County and can be used to address OSSF issues throughout the region. Funding has also been supplied by industrial partners for projects in Brazoria County.

Coordination of H-GAC's Homeowner Wastewater Assistance Program occurs through the WQMP project. The WQMP contract does not fund any OSSF repair and replacement projects, as that funding strictly comes from one or more of the SEP funding sources. However, the WQMP supports the SEP program as a component of the water quality planning process, particularly the outreach and education component of the SEP. Through the SEP, H-GAC can identify failing OSSFs, either through homeowner self-disclosure or reported through referrals from Authorized Agents or OSSF professionals. This is an important planning tool used by H-GAC in addressing OSSFs as a major contributor to bacterial impairments in the region. By identifying these systems and then targeting them for repair, replacement, or decommissioning through the SEP, H-GAC can actively contribute to the remediation of these failing systems.

H-GAC's efforts largely target priority watersheds (such as those monitored by the Clean Rivers Program or subject to a WPP or TMDL) to identify areas with failing OSSFs and evaluate best management practices to address the issue. Efforts are coordinated with the appropriate H-GAC staff for each watershed project, as well as the local permitting and enforcement agencies.

SEP activities supported by the WQMP include coordinating with elected government officials and enforcement agencies to promote the program and presenting at numerous meetings to inform homeowners and OSSF professionals about the program and the qualifications that applicants must meet to qualify.

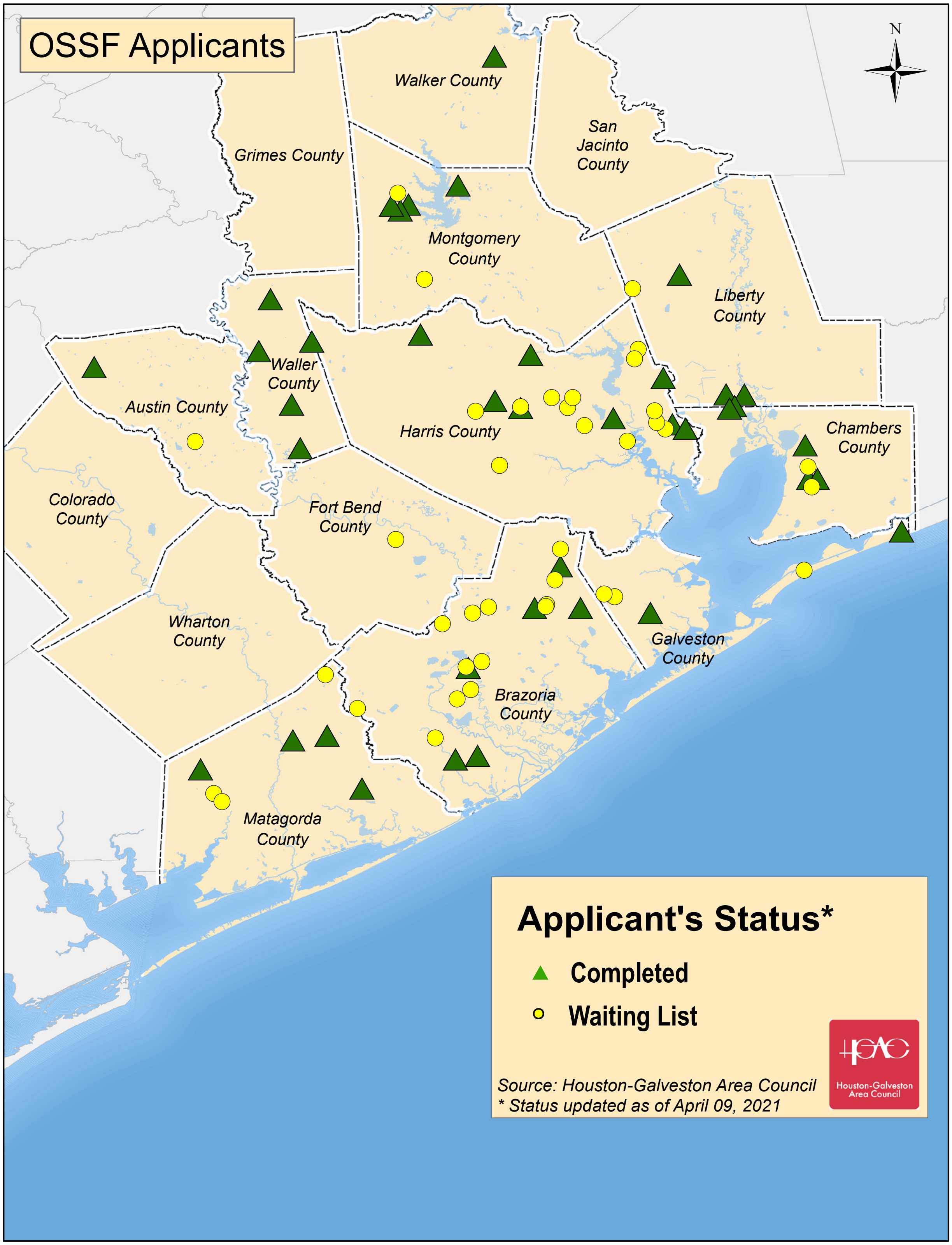
As of 7/1/21, the SEP program has funded the replacement of 25 failed OSSFs and the repair of 14 malfunctioning OSSFs (Table 23). Due to diminished funding levels as well as COVID-19 travel and social distancing restrictions, H-GAC was only able to complete two OSSF replacements in FY 2021 (one in Austin County and one in Matagorda County), with another scheduled before the end of the project year (Brazoria County). In addition to those systems that have been repaired or replaced, H-GAC has 38 homeowners on a waiting list.

Map 15 shows the spatial distribution of projects throughout the basin.

TABLE 23: SEP OSSF Replacements and Repairs by County, 2018 - 2020

County	Replacement	Repair	Waiting
Austin	1	-	1
Brazoria	3	3	12
Chambers	4	-	3
Fort Bend	-	-	1
Galveston	2	-	3
Harris	5	3	12
Liberty	-	4	1
Matagorda	3	1	3
Montgomery	2	2	2
Walker	-	1	-
Waller	5	-	-
TOTAL	**25**	**14**	**38**

MAP 15: SEP OSSF Replacement and Repair Projects, 2018 - 2020



SUMMARY

The FY 2021 Water Quality Management Plan Update Report summarizes the activities conducted under Contract 582-21-10118 from the Texas Commission on Environmental Quality.

For this year's Project, H-GAC acquired and analyzed wastewater treatment facility infrastructure data for the Region. Both the wastewater permitted discharger GIS layer and the Service Area Boundary GIS layer were updated as part of this work, expanding the data repository that H-GAC maintains. This data is used throughout multiple H-GAC programs, such as the Clean Rivers Program, as well as watershed-based plans, such as WPPs and TMDLs.

A primary component of the WQMP Update involves the acquisition and analysis of self-reported Discharge Monitoring Report data. These data are important for evaluating potential sources of bacteria in area waterways. Analysis of WWTF effluent monitoring data provides a means by which decision makers and water resource managers can evaluate the role wastewater infrastructure plays in regional water quality issues. The analysis provided in this report shows wastewater treatment facilities are typically operating within compliance of their effluent discharge permit limits for bacteria. However, considering the volume of discharge and the potential for high bacteria loading in the case of a system malfunction, it is prudent to continue to monitor the DMR data closely. The DMR data acquired through this project are important for other watershed-based projects within the region, most notably the Bacteria Implementation Group. Through addressing issues such as wastewater treatment facility discharge permit limits, the BIG has been very successful in reducing bacteria loading in the region's water bodies.

As part of the WQMP Update, H-GAC also analyzed self-reported Sanitary Sewer Overflow data for the Region. SSO data are of great interest due to the potential for acute loading of extremely elevated levels of human fecal bacteria. H-GAC analyzed the frequency, volume, and root causes of SSOs.

H-GAC continues to develop and foster relationships with interested parties in the region's watersheds and coordinate regional water quality activities. H-GAC has been a leader in TMDL and WPP efforts, and the coordination activities of the WQMP Update Project mesh well with the overall approach of outreach, targeted studies, and implementation activities. By having multiple water quality projects concurrently within the same organization, H-GAC is able to achieve vertical integration between base data sources, internal analysis, watershed planning efforts, and external coordination.

The OSSF Database development which started in previous projects continued during this year and will be an ongoing effort that will be continuously updated. This project deliverable remains useful in H-GAC's various watershed planning efforts. H-GAC acquires OSSF permit data from Authorized Agents throughout the Region and consolidates that data into a regional database. An estimation of unpermitted OSSFs is also performed through this project. The number, location, and density of these OSSFs are important considerations in the development of watershed-based plans. This information is also useful in targeting OSSF homeowner education and outreach programs or OSSF repair and replacement initiatives.

H-GAC is the Third Party Administrator for a Supplemental Environmental Project to repair or replace malfunctioning or failed OSSFs for qualifying homeowners within the region. Through this SEP, H-GAC addressed numerous failing systems. Although the WQMP Contract does not fund any OSSF repair or replacement, many of the coordination, outreach, and education activities are conducted through this Project.

The accumulated data sets, the GIS analyses, and other deliverables generated through this Project have been submitted electronically to TCEQ. Where allowable and appropriate, data from this Project will be used to support other related efforts.

This *WQMP Update Report*, once accepted by the H-GAC Board of Directors and certified by TCEQ, will be incorporated into the State's Water Quality Management Plan.

WATER QUALITY MANAGEMENT PLAN UPDATE TIMELINE

The *Water Quality Management Plan Update Report* summarizes all contract activities and findings relevant to the water quality goals of the Region. A draft of this Update Report has been made available for public comment in accordance with Texas Water Code (TWC) Section 26.037 to allow interested parties the opportunity to comment and provide input into the WQMP Update. The report has also been submitted to the Natural Resources Advisory Committee for review and comment. Comments received will be addressed in the report. A table documenting comments received and H-GAC's written response to those comments will be incorporated into the Final WQMP Report as an Appendix (see Appendix D).The Final *WQMP Update Report* will be submitted to H-GAC's Board of Directors for acceptance. Once accepted by the Board, the Update will be certified by TCEQ for inclusion in the State's Water Quality Management Plan.

The timeline presented in Table 24 was established to meet the requirements of TWC Section 26.037 related to the public comment period for the report.

TABLE 24: WQMP Report Review, Acceptance, and Submittal Timeline

Task	Due Date
WQMP Update Draft Report and Project Data Deliverables due to TCEQ	7/1/2021
Thirty-Day Public Comment Period Opens	7/1/2021
Send Draft WQMP Update Report electronically to NRAC members for review	7/1/2021
Upload Draft WQMP Update Report to H-GAC's website	7/1/2021
Public Comment Period closes	7/31/2021
Revise Draft WQMP Update Report to address public comments	7/31/20 - 8/5/2021
Present Final WQMP Update Report to NRAC for recommendation to Board of Directors	8/5/2021
H-GAC Board of Directors Meeting	8/17/2021
Upload Final WQMP Report to H-GAC's website	8/31/2021
Submit Final WQMP Update Report and documentation of public comment period to TCEQ	8/31/2021

ADDITIONAL RESOURCES

The following resources are provided for additional information on topics discussed in this report:

H-GAC

Water Quality Management Planning
https://www.h-gac.com/water-quality-management-planning

On-Site Sewage Facilities (OSSF)
https://www.h-gac.com/on-site-sewage-facilities

OSSF Information System
https://datalab.h-gac.com/OSSF/

Clean Rivers Program
https://www.h-gac.com/clean-rivers-program

Clean Rivers Program 2021 Basin Summary Report
https://datalab.h-gac.com/BSR2021

Water Resources Information Map (WRIM)
http://h-gac.com/go/wrim

Natural Resources Advisory Committee (NRAC)
https://www.h-gac.com/board-of-directors/advisory-committees/natural-resources-advisory-committee

Clean Waters Initiative Workshops
https://www.h-gac.com/clean-water-initiative-workshops

Bacteria Implementation Group (BIG)
https://www.h-gac.com/bacteria-implementation-group

Watershed-Based Plans
https://www.h-gac.com/watershed-based-plans

Coastal Communities
http://www.coastalcommunitiestx.com/

TCEQ

Texas Surface Water Quality Standards
https://www.tceq.texas.gov/waterquality/standards

Texas Integrated Report of Surface Water Quality
https://www.tceq.texas.gov/waterquality/assessment

Texas Clean Rivers Program
https://www.tceq.texas.gov/waterquality/clean-rivers/index.html

Surface Water Quality Segments Viewer
https://www.tceq.texas.gov/gis/segments-viewer

Surface Water Quality Web Reporting Tool
https://www80.tceq.texas.gov/SwqmisPublic/index.htm

State Water Quality Management Plan
https://www.tceq.texas.gov/permitting/wqmp

Total Maximum Daily Load Program
https://www.tceq.texas.gov/waterquality/tmdl/index.html

Nonpoint Source Program
https://www.tceq.texas.gov/waterquality/nonpoint-source/index

Wastewater and Stormwater Permitting
https://www.tceq.texas.gov/permitting/wastewater

TCEQ GIS Data
https://www.tceq.texas.gov/gis/download-tceq-gis-data

Supplemental Environmental Projects
https://www.tceq.texas.gov/compliance/enforcement/sep

On-Site Sewage Facilities Rules and Regulations
https://www.tceq.texas.gov/permitting/ossf/ossfregulators.html

Galveston Bay Estuary Program
https://gbep.texas.gov/

TWDB

Clean Water State Revolving Fund (CWSRF) Loan Program
http://www.twdb.texas.gov/financial/programs/CWSRF/index.asp

APPENDICES

LIST OF APPENDICES

APPENDIX A - Wastewater Data Update and Coordination Data Deliverables

The following Contract Deliverables were submitted electronically with this report:

GIS LAYERS

- Wastewater Outfalls GIS Layer
- Service Area Boundaries GIS Layer

MAPS

- SAB_2021_Outfalls
- SAB_2021
- DMR_Frequency_2016_2020
- DMR_Frequency_2020
- DMR_Occurrences_2016_2020
- DMR_Occurrences_2020
- SSO_Frequency_2020
- SSO_Occurrences_2020

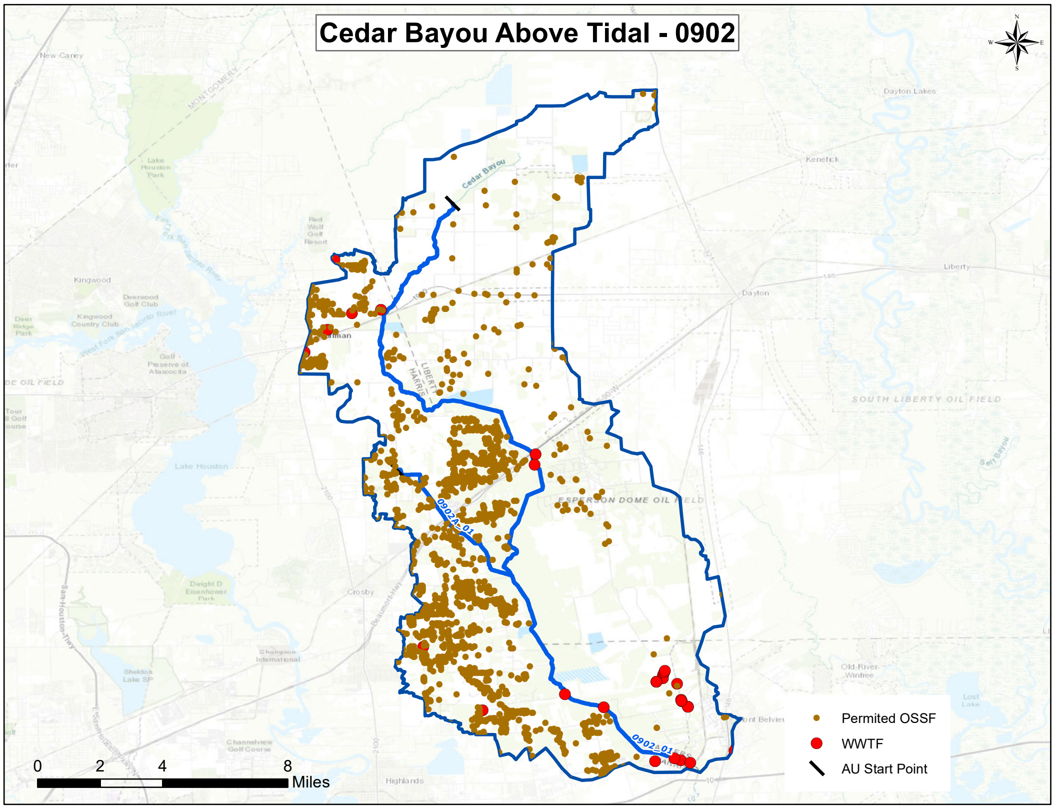
APPENDIX B - OSSF Database Update Data Deliverables

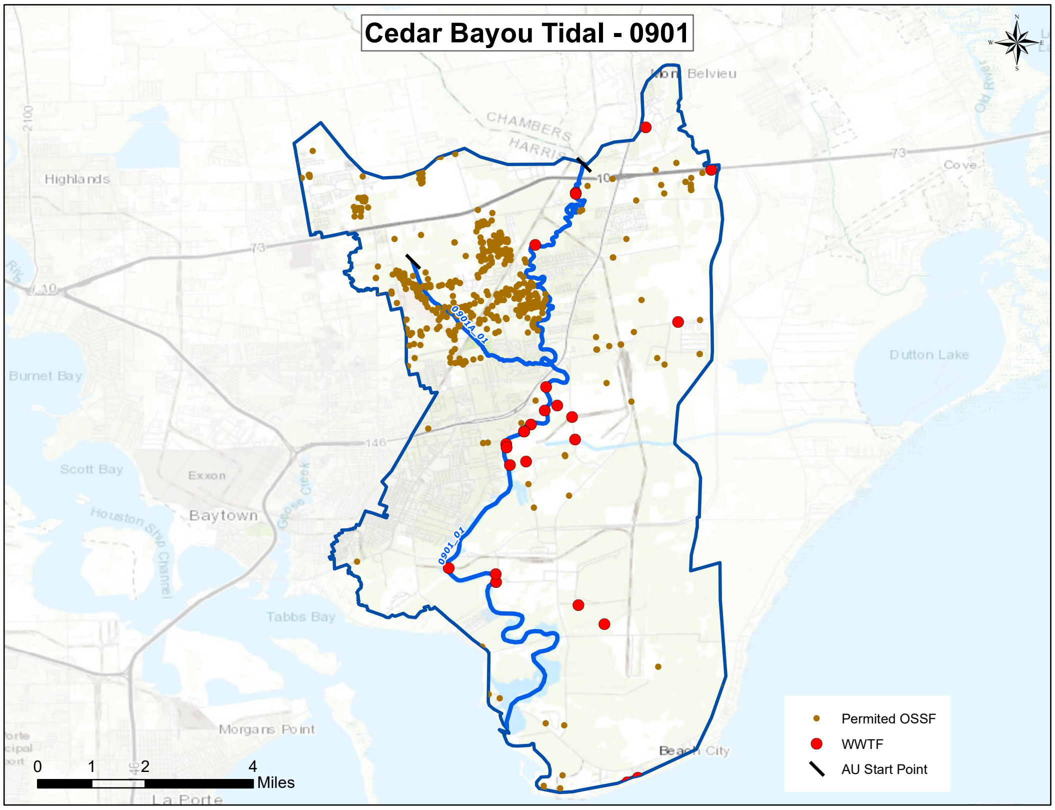
The following Contract Deliverables were submitted electronically with this report:

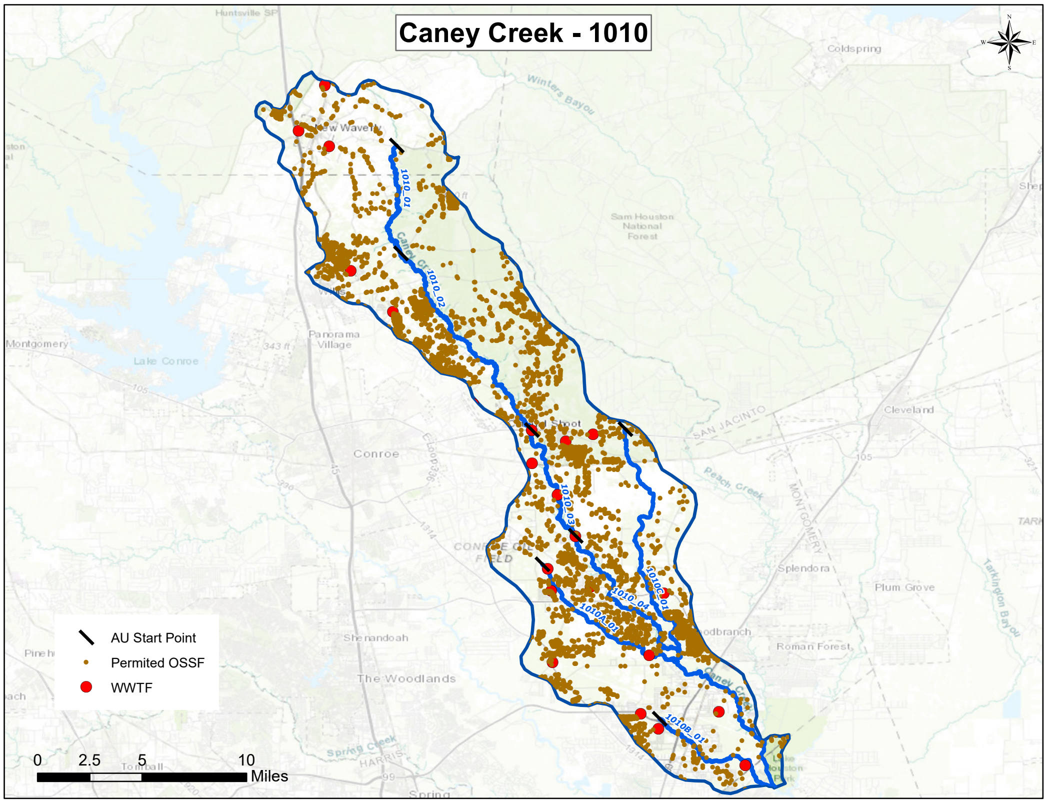
GIS LAYERS
- Permitted OSSF Database
- Unpermitted OSSF Analysis

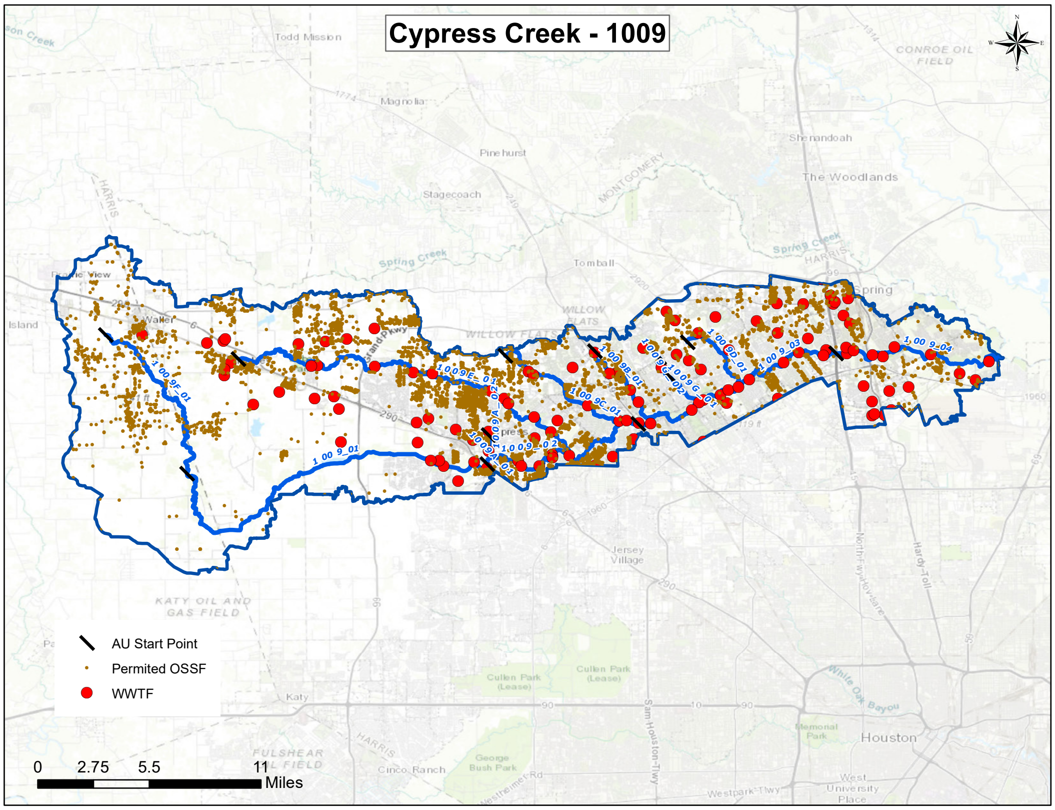
MAPS
- 2021_Regional_OSSFs_Map
- 2021_Regional_OSSFConcentration_Map
- 2021_Regional_Unpermit_OSSFs_Map
- OSSF Applicants Map 04-09-2021

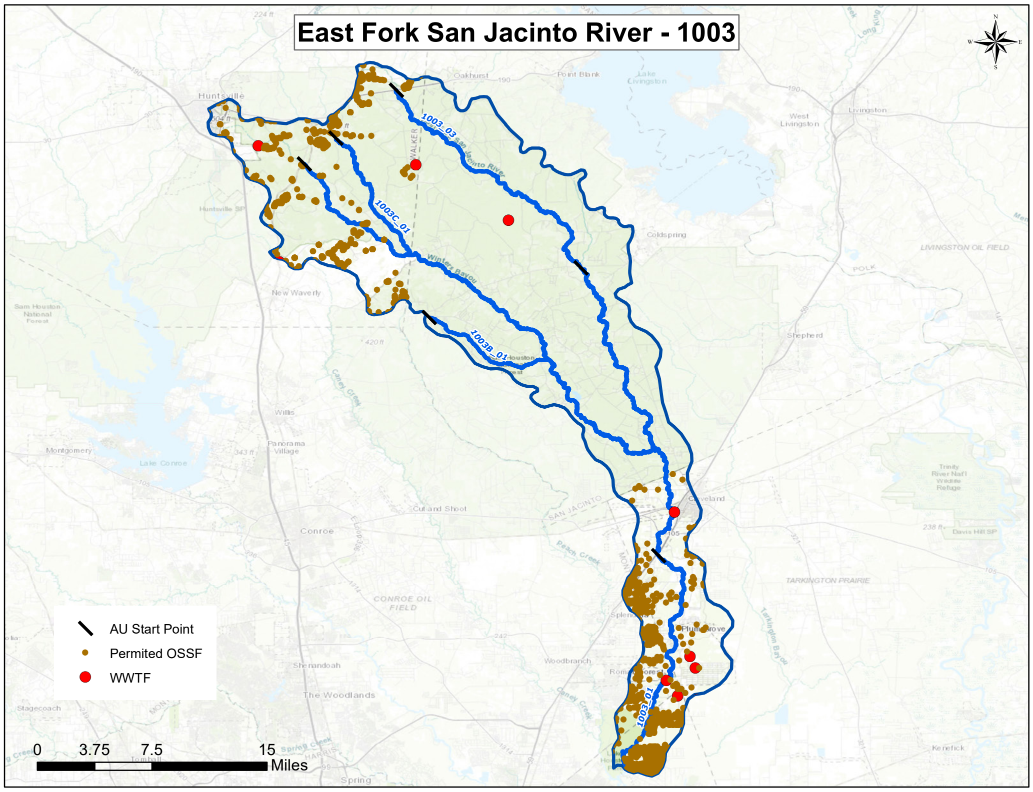
APPENDIX C - Wastewater Outfalls and OSSFs by Watershed

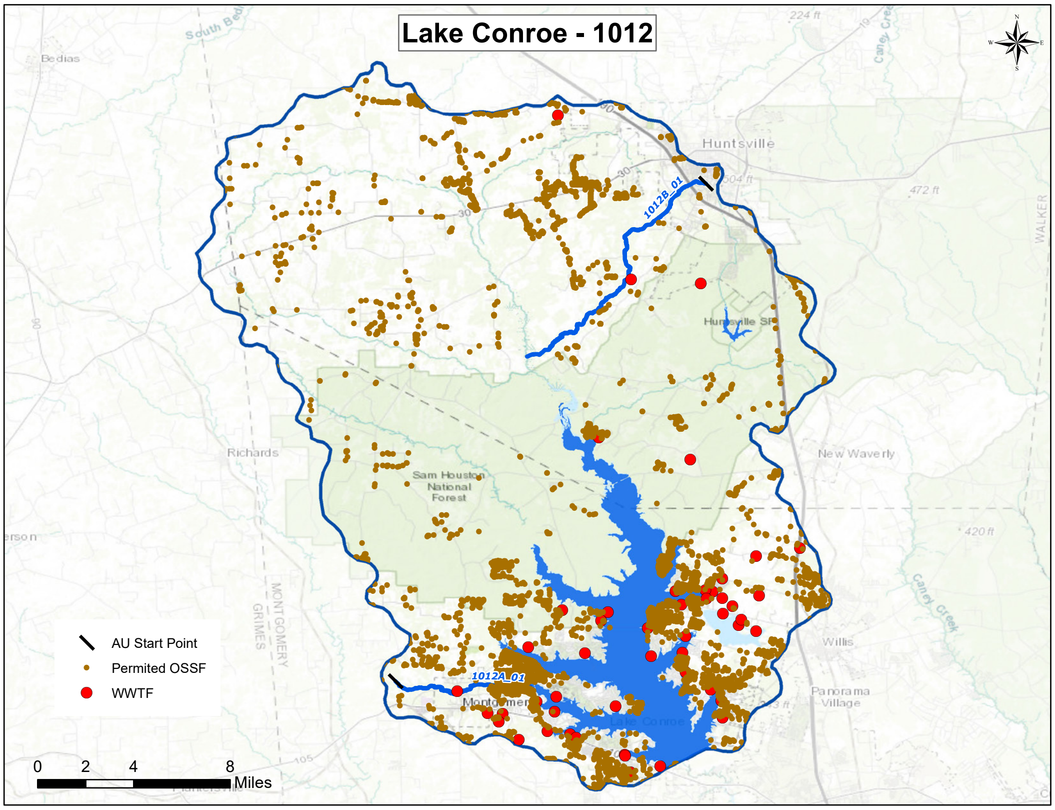


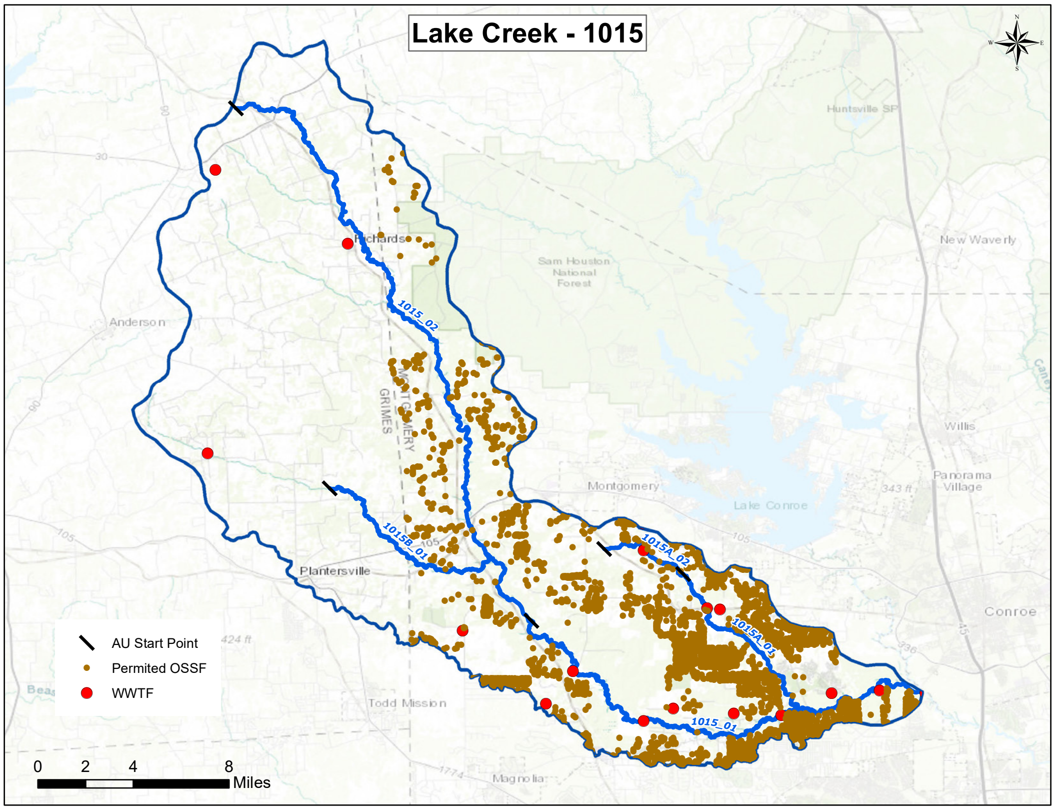


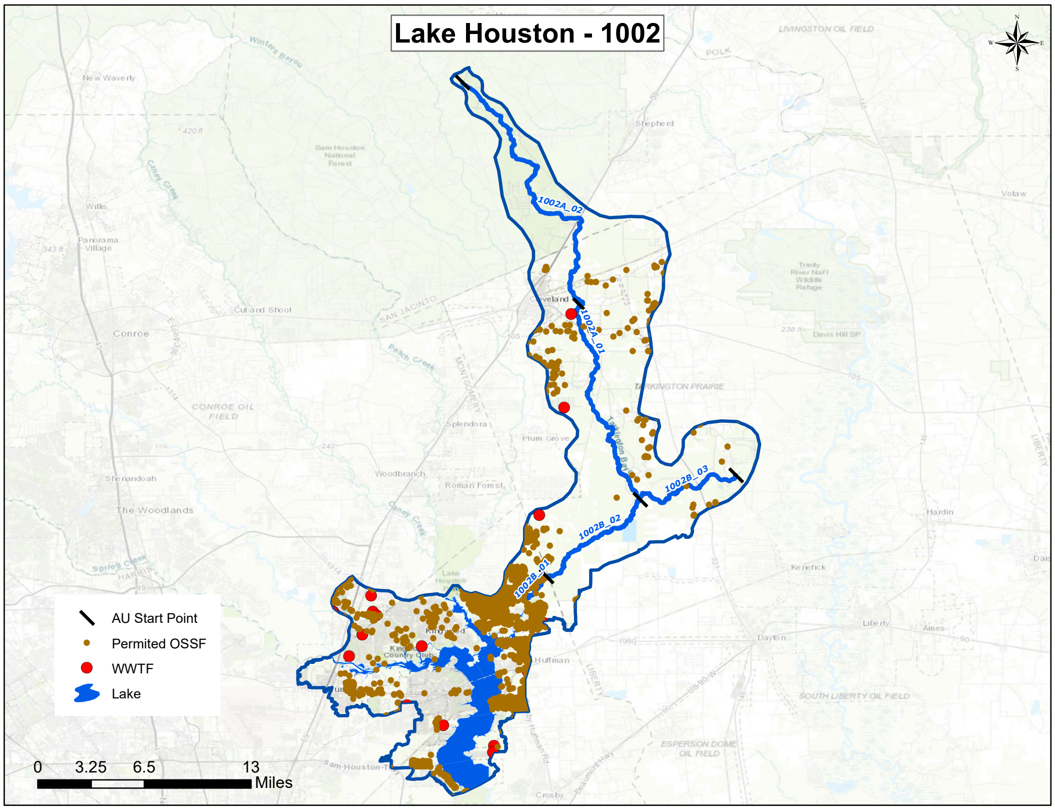

Caney Creek - 1010
AU Start Point
Permited OSSF
WWTF
0
2.5
5
10
Miles
1010_01
1010_02
1010_03
1010_04
1010A_01
1010C_01
1010B_01
Conroe
The Woodlands
Shenandoah
Panorama Village
Montgomery
Lake Conroe
Sam Houston National Forest
Cleveland
Splendora
Plum Grove
Roman Forest
Coldspring
Spring

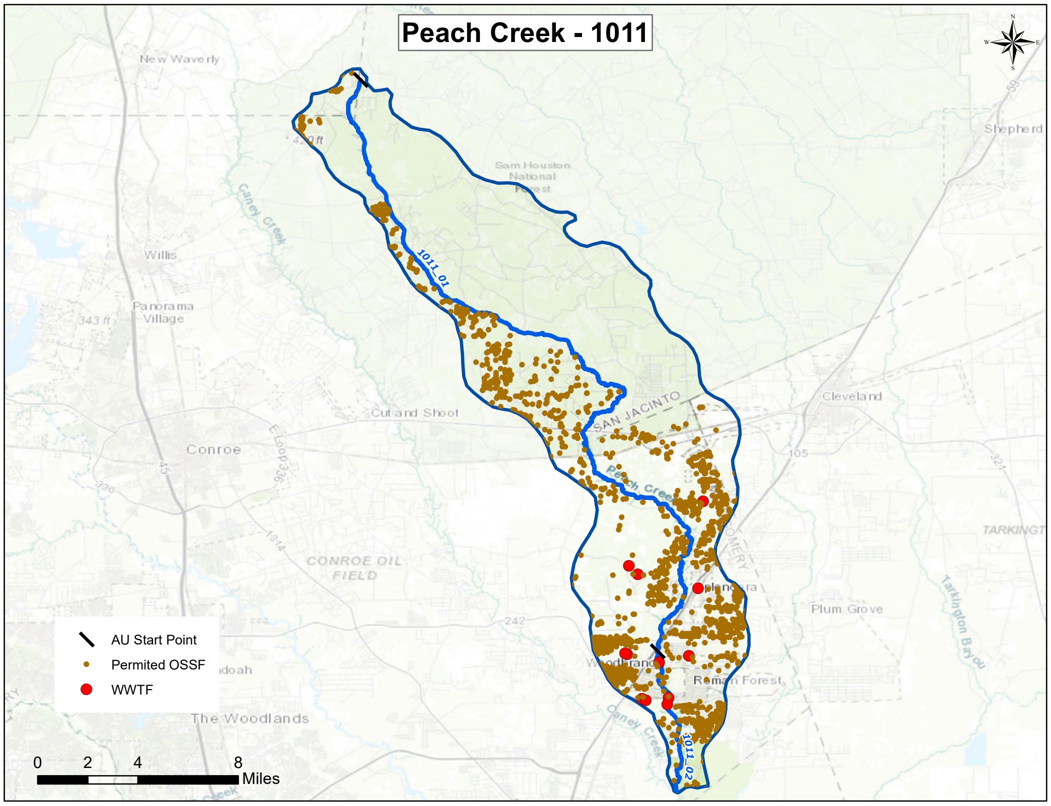

Cypress Creek - 1009
AU Start Point
Permited OSSF
WWTF
0
2.75
5.5
11
Miles
Todd Mission
Magnolia
Pinehurst
Stagecoach
Tomball
Shenandoah
The Woodlands
Spring
Waller
Jersey Village
Katy
Cinco Ranch
Houston
KATY OIL AND GAS FIELD
CONROE OIL FIELD

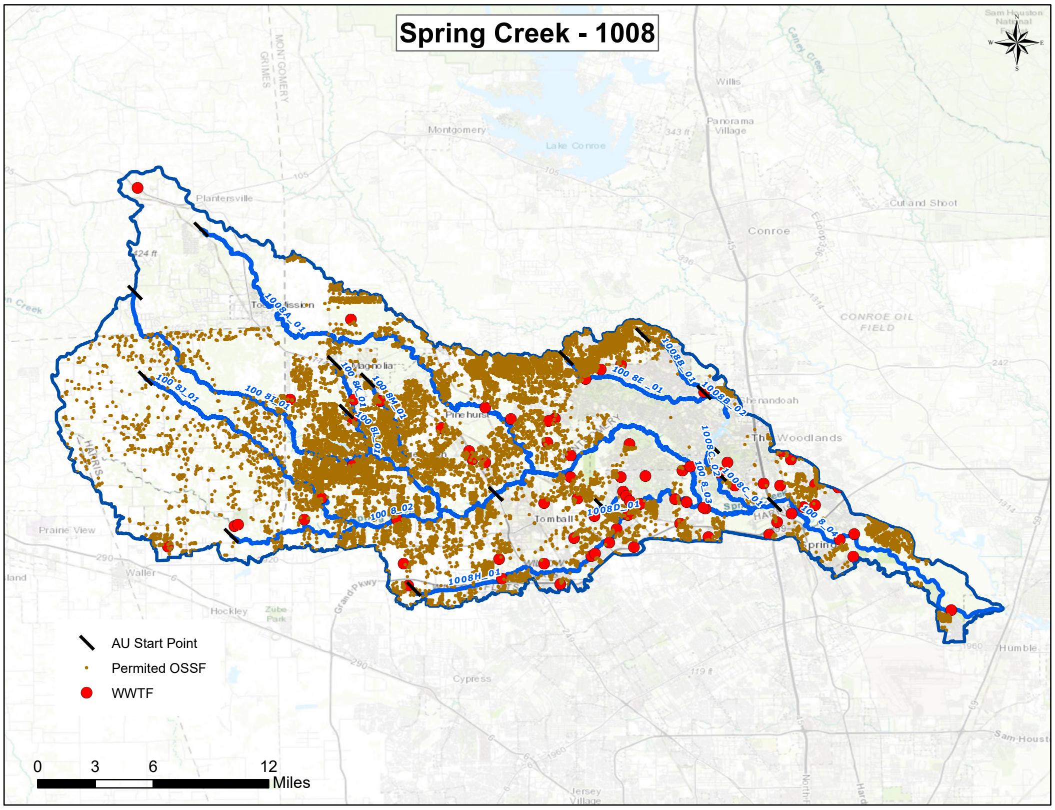

East Fork San Jacinto River - 1003
AU Start Point
Permited OSSF
WWTF
0
3.75
7.5
15
Miles
1003_03
1003C_01
1003B_01
1003_01

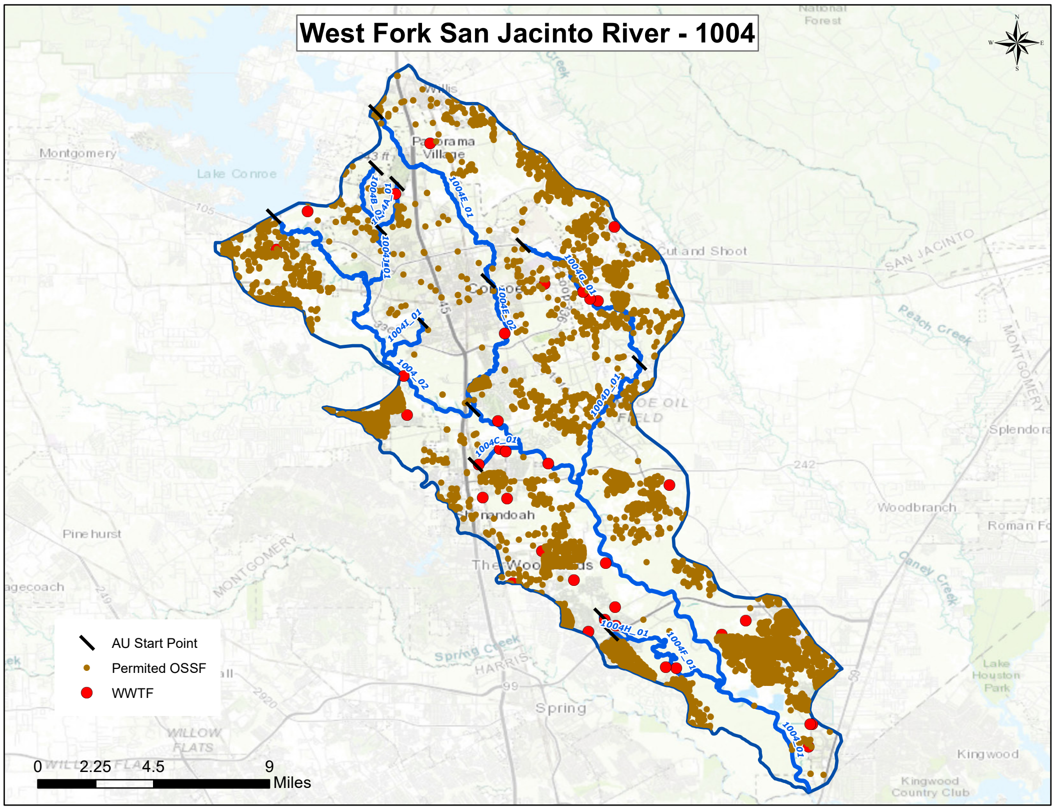

Lake Conroe - 1012
AU Start Point
Permited OSSF
WWTF
0
2
4
8
Miles
1012B_01
1012A_01
Huntsville
Sam Houston National Forest
New Waverly
Willis
Panorama Village
Richards

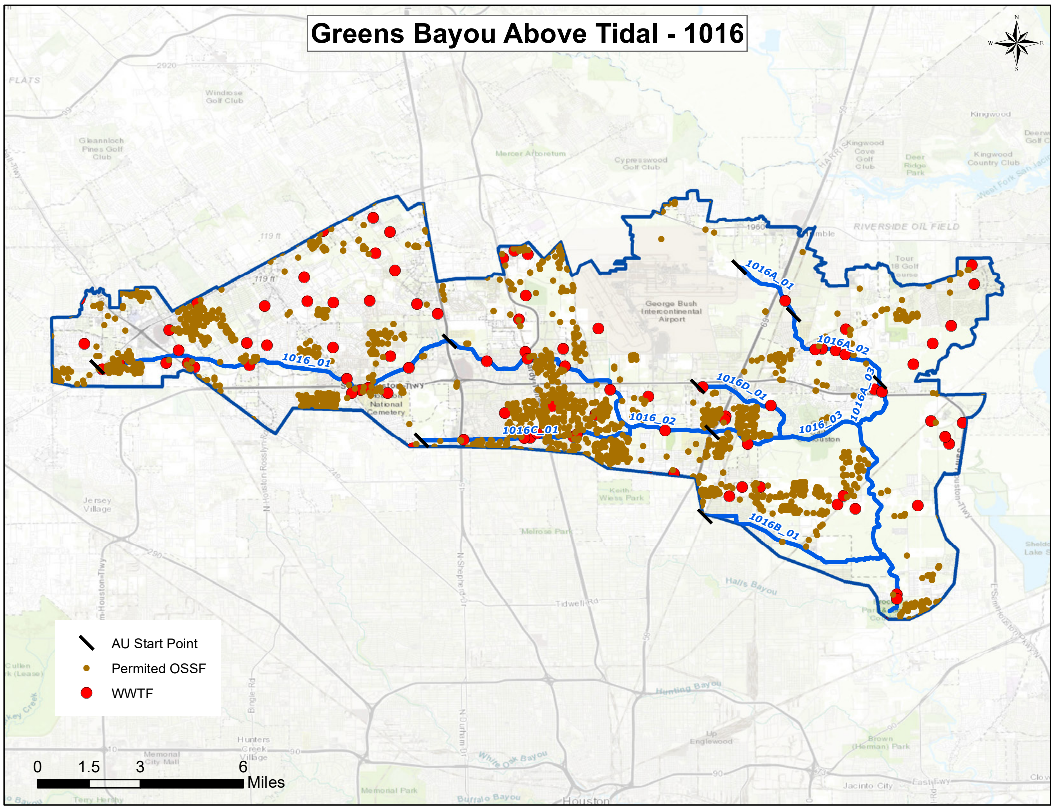

Lake Creek - 1015
AU Start Point
Permited OSSF
WWTF
0 2 4 8
Miles
1015_02
1015B_01
1015A_02
1015A_01
1015_01
Richards
Anderson
Plantersville
Montgomery
Lake Conroe
Conroe
Todd Mission
Magnolia
Sam Houston National Forest
New Waverly
Willis
Panorama Village
Huntsville SP
GRIMES
MONTGOMERY

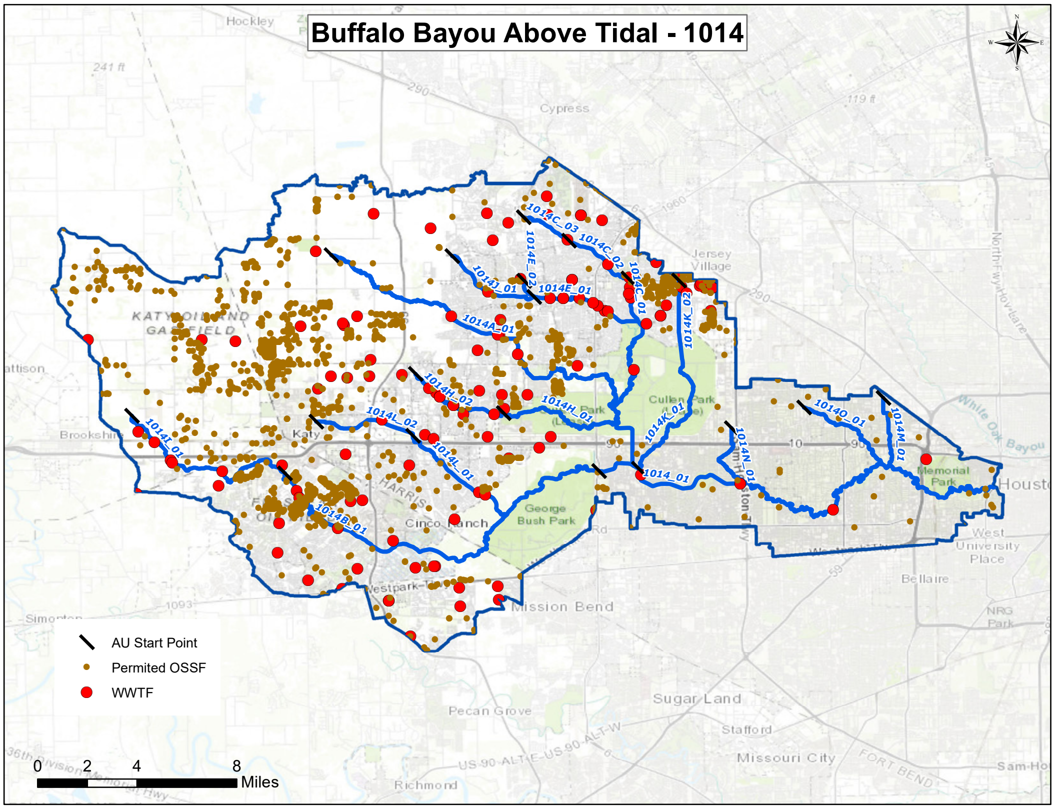

Lake Houston - 1002
AU Start Point
Permited OSSF
WWTF
Lake
0 3.25 6.5 13
Miles
1002A_02
1002A_01
1002B_03
1002B_02
1002B_01

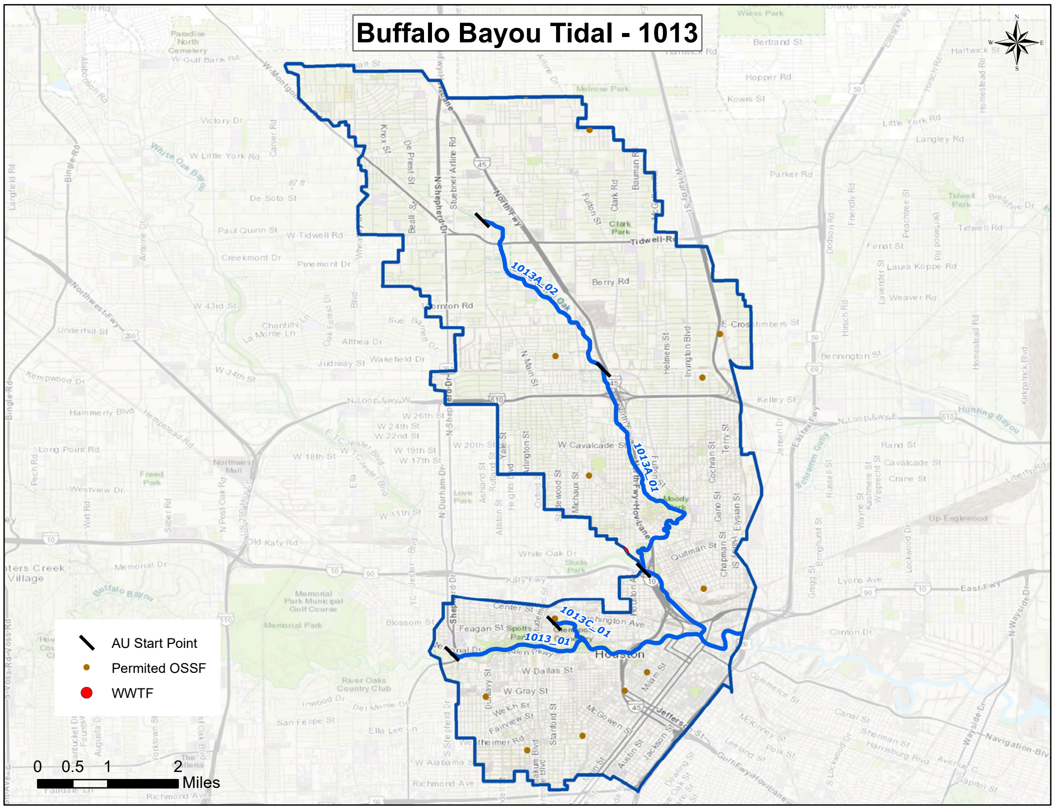

Peach Creek - 1011
AU Start Point
Permited OSSF
WWTF
0 2 4 8 Miles
1011_01
1011_02
Peach Creek
New Waverly
Willis
Panorama Village
Conroe
Cut and Shoot
SAN JACINTO
Cleveland
Shepherd
Sam Houston National Forest
CONROE OIL FIELD
Plum Grove
Roman Forest
The Woodlands
Caney Creek
Tarkington Bayou

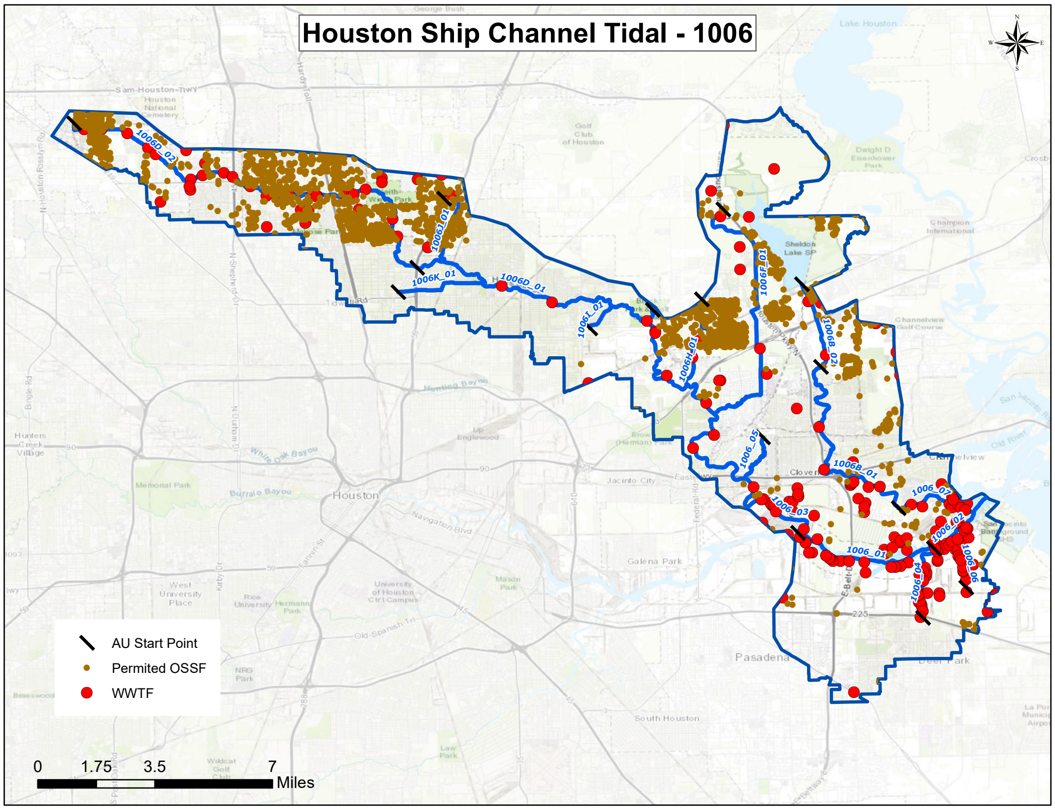

Spring Creek - 1008
AU Start Point
Permited OSSF
WWTF
0 3 6 12 Miles
1008A_01
1008B_01
1008B_02
1008E_01
1008H_01
1008D_01
1008_02
1008_03
1008_04
Plantersville
Todd Mission
Magnolia
Pinehurst
Tomball
Montgomery
Lake Conroe
Willis
Panorama Village
Conroe
Cut and Shoot
CONROE OIL FIELD
Shenandoah
The Woodlands
Spring
Prairie View
Waller
Hockley
Cypress
Jersey Village
Humble

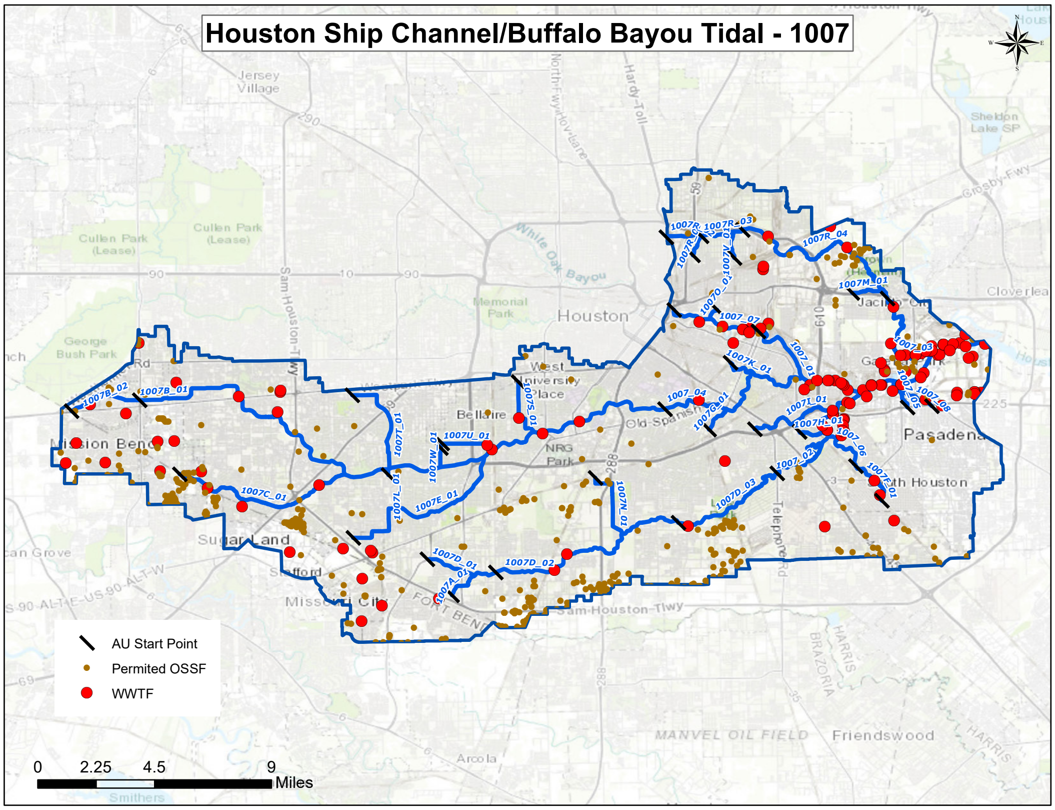

West Fork San Jacinto River - 1004
AU Start Point
Permited OSSF
WWTF
0 2.25 4.5 9 Miles

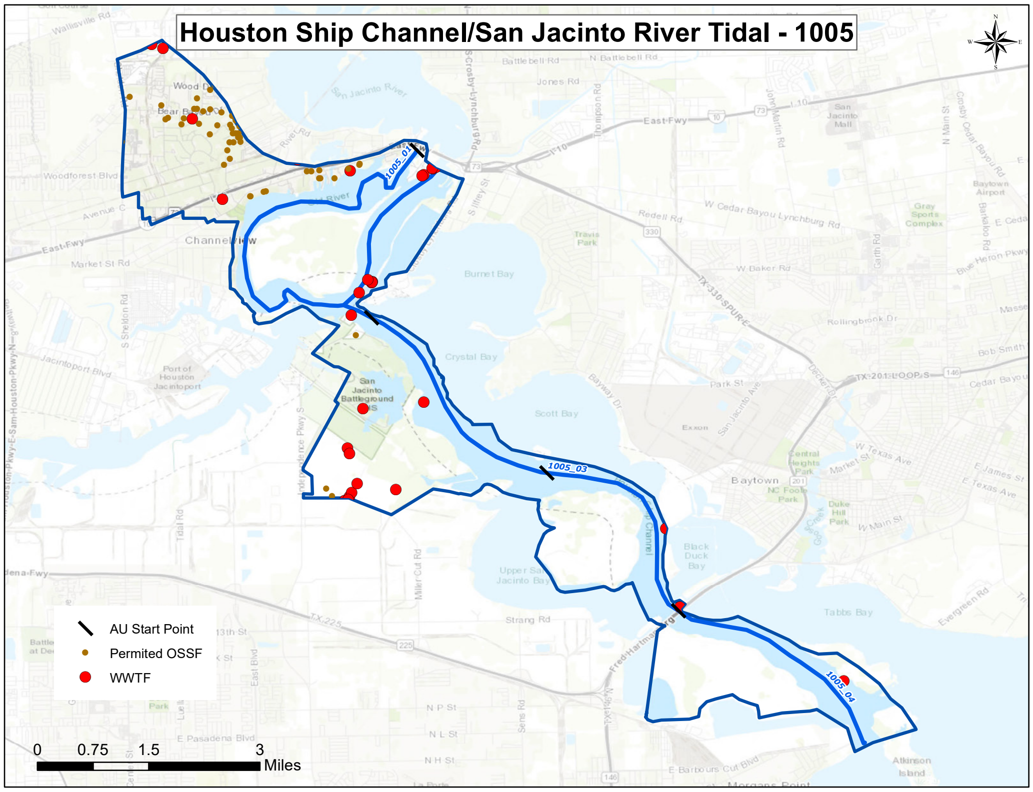

Greens Bayou Above Tidal - 1016
AU Start Point
Permited OSSF
WWTF
0 1.5 3 6 Miles

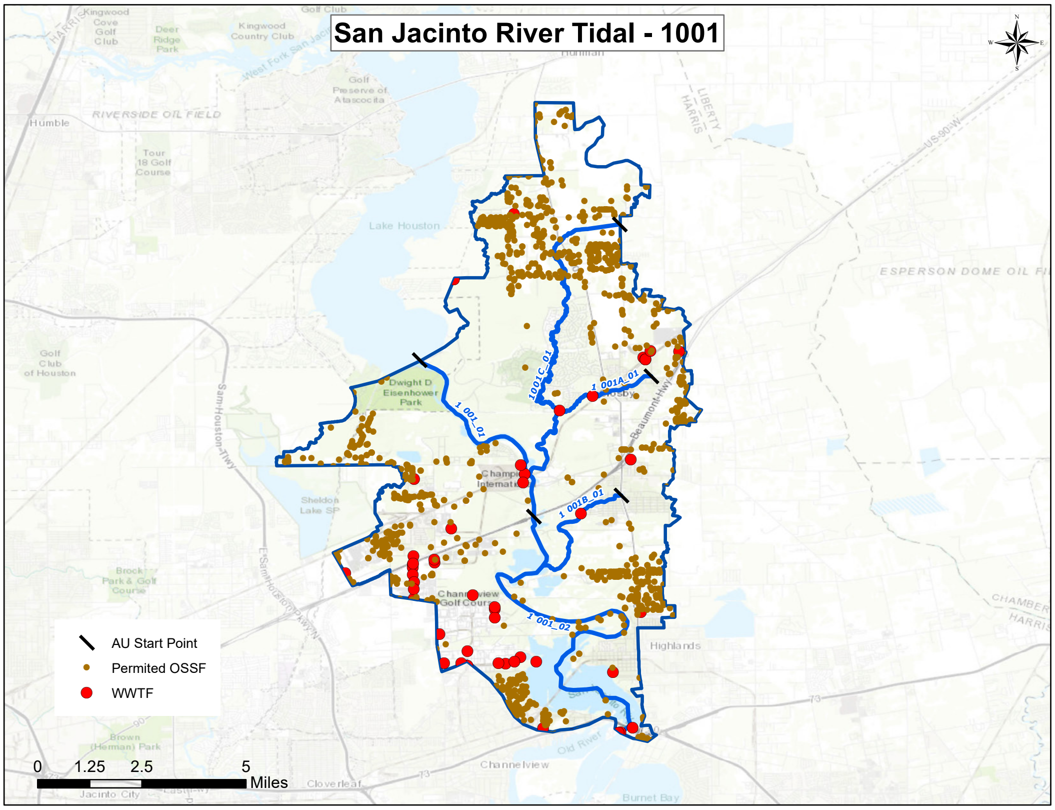

Buffalo Bayou Above Tidal - 1014
AU Start Point
Permited OSSF
WWTF
0 2 4 8
Miles
1014C_03
1014C_02
1014C_01
1014E_02
1014E_01
1014J_01
1014A_01
1014K_02
1014H_02
1014H_01
1014L_02
1014L_01
1014I_01
1014B_01
1014K_01
1014_01
1014N_01
1014O_01
1014M_01

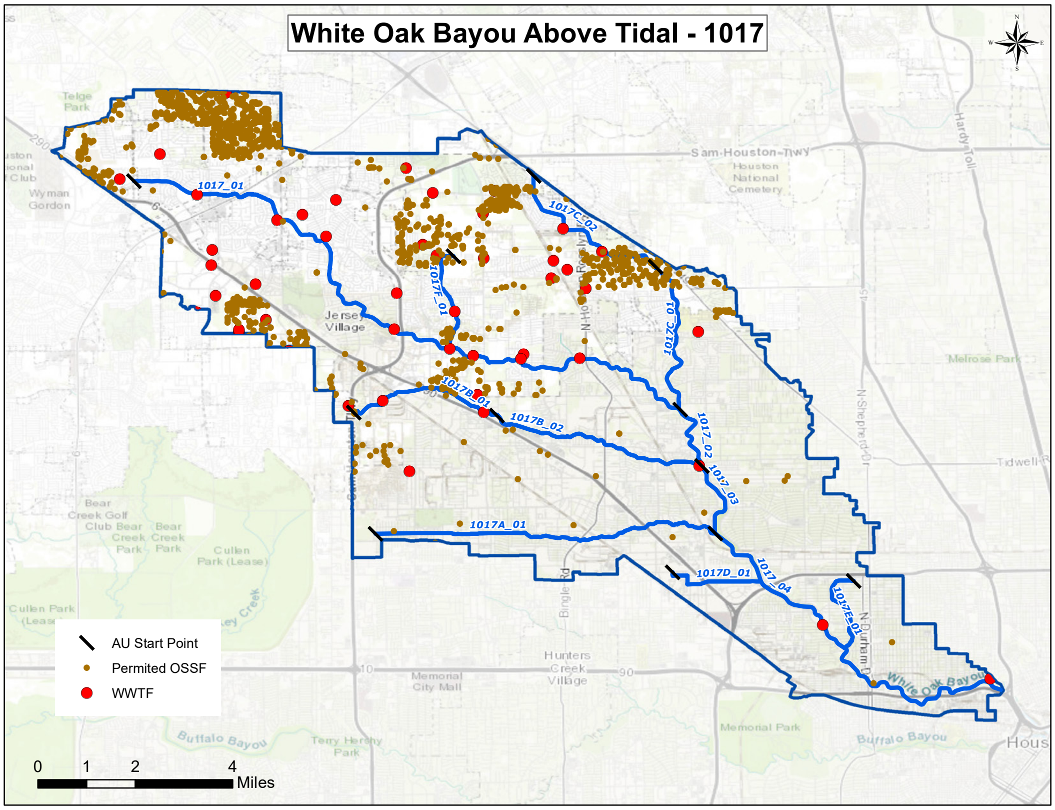

Buffalo Bayou Tidal - 1013
AU Start Point
Permited OSSF
WWTF
0 0.5 1 2
Miles
1013A_02
1013A_01
1013C_01
1013_01

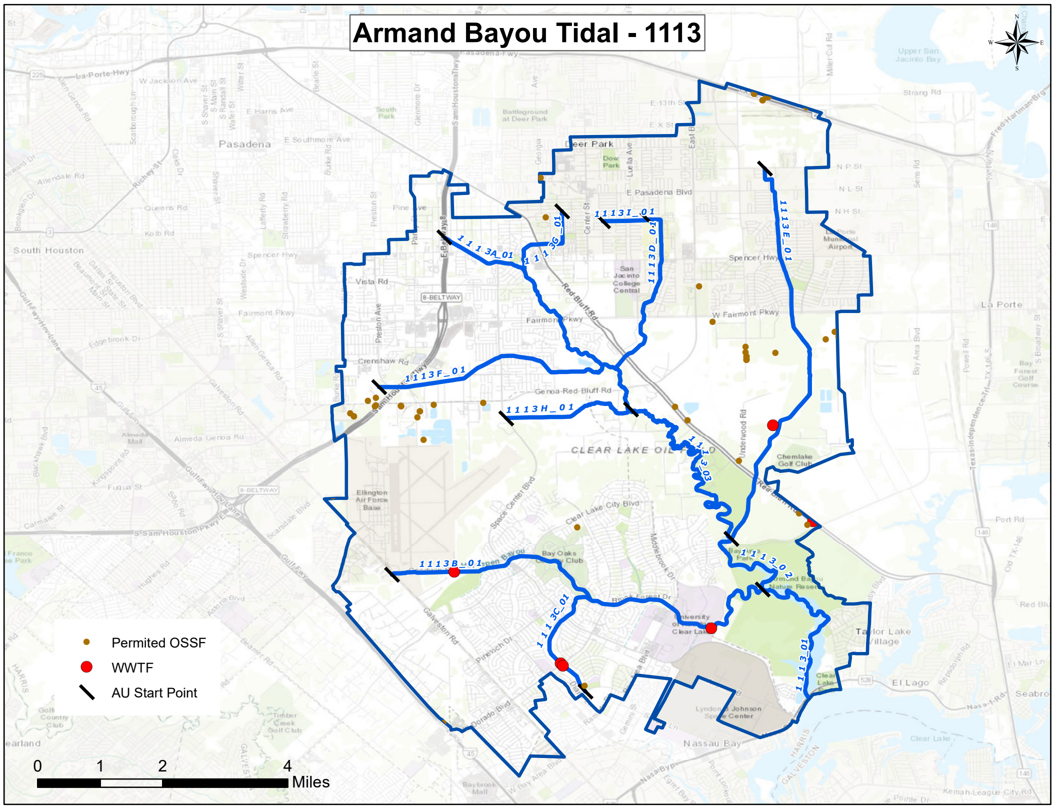

Houston Ship Channel Tidal - 1006
AU Start Point
Permited OSSF
WWTF
0 1.75 3.5 7 Miles

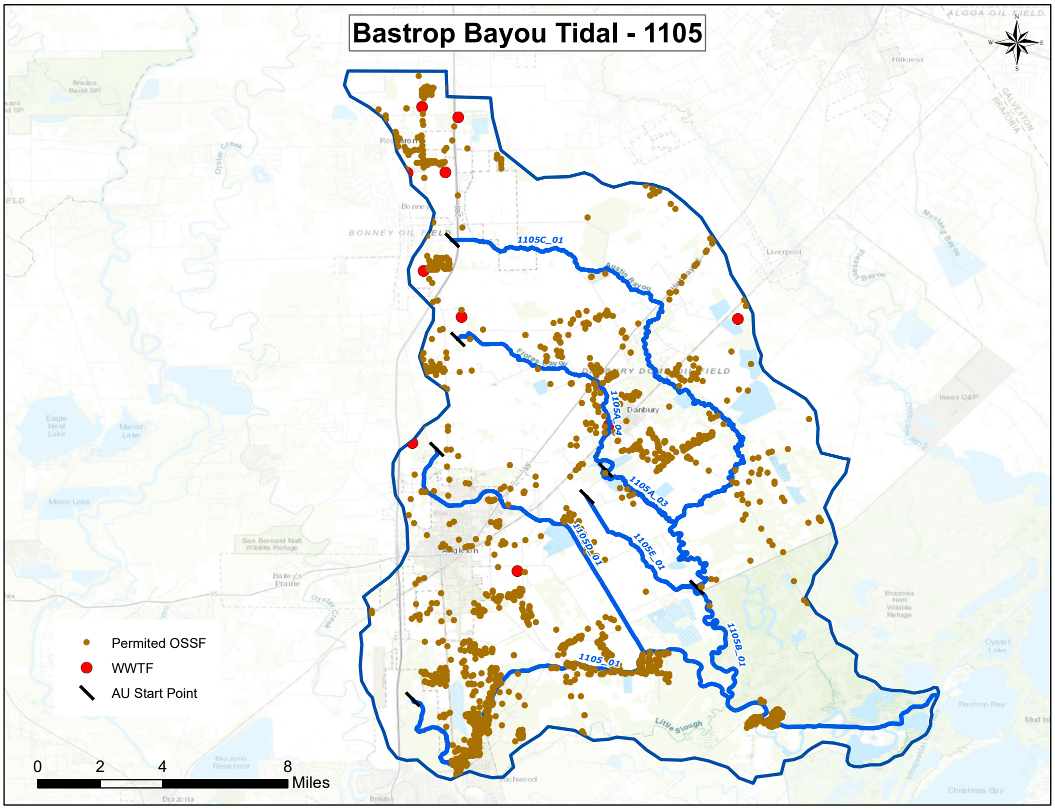

Houston Ship Channel/Buffalo Bayou Tidal - 1007
AU Start Point
Permited OSSF
WWTF
0 2.25 4.5 9 Miles

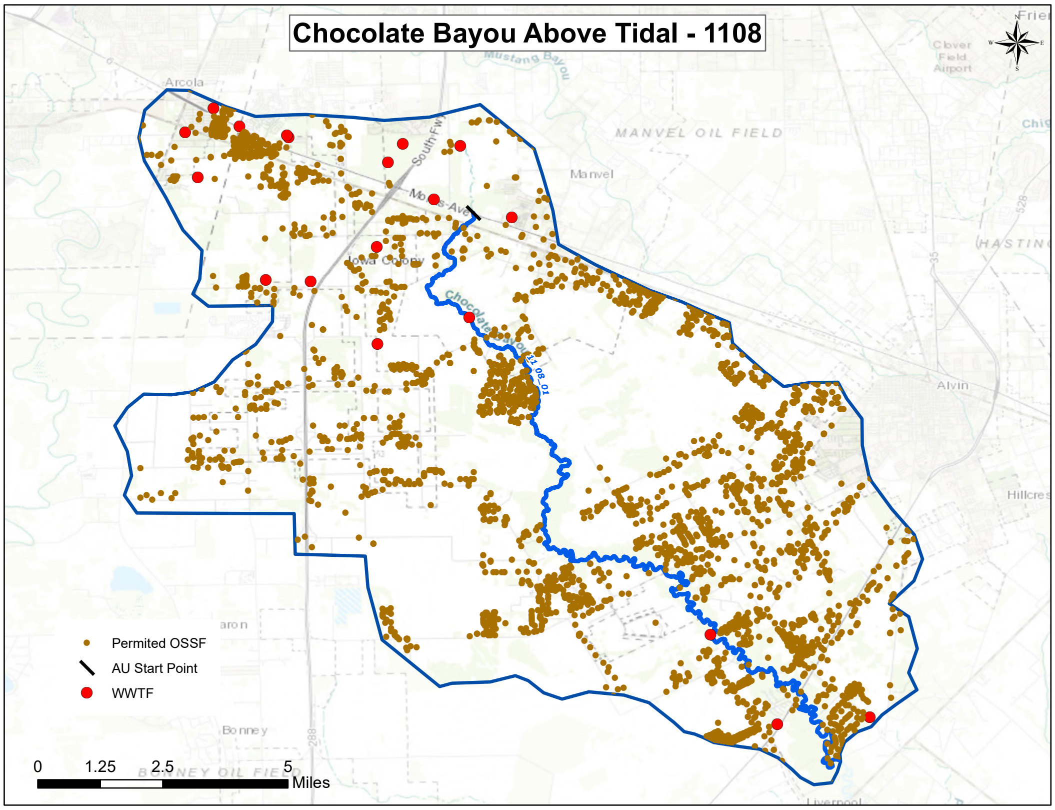

Houston Ship Channel/San Jacinto River Tidal - 1005
AU Start Point
Permited OSSF
WWTF
0 0.75 1.5 3 Miles

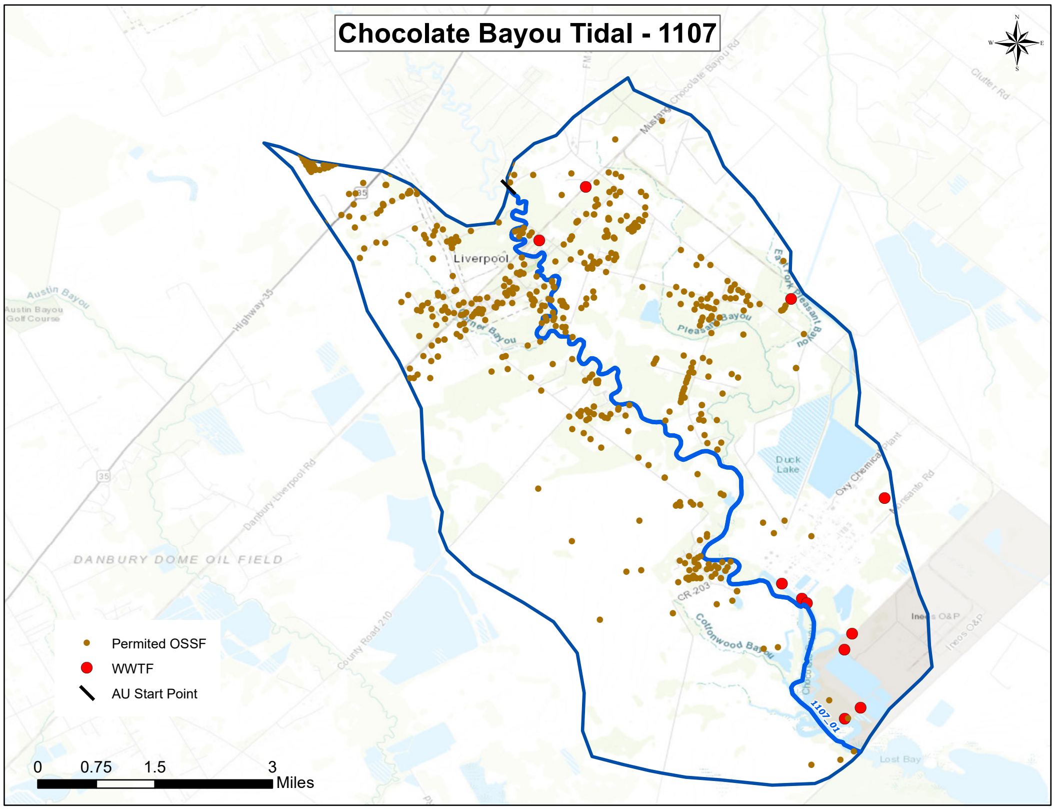

San Jacinto River Tidal - 1001
AU Start Point
Permited OSSF
WWTF
0 1.25 2.5 5 Miles

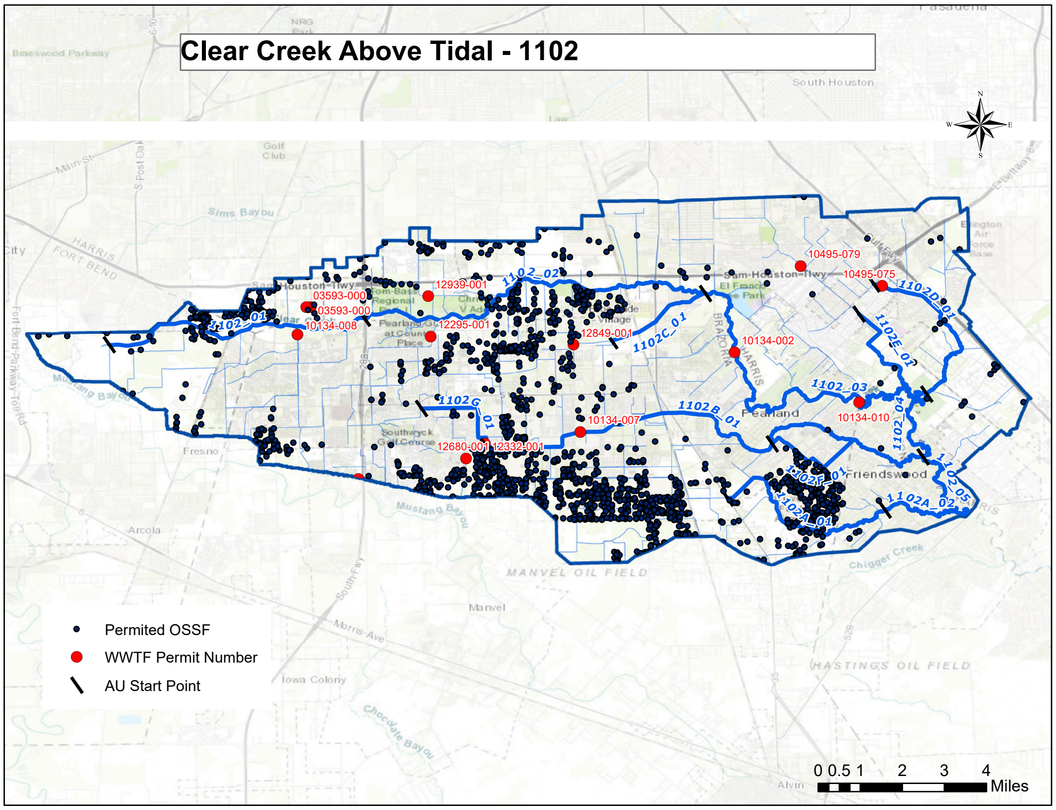

White Oak Bayou Above Tidal - 1017
1017_01
1017C_02
1017F_01
1017C_01
1017B_01
1017B_02
1017_02
1017_03
1017A_01
1017D_01
1017_04
1017E_01
AU Start Point
Permited OSSF
WWTF
0 1 2 4
Miles

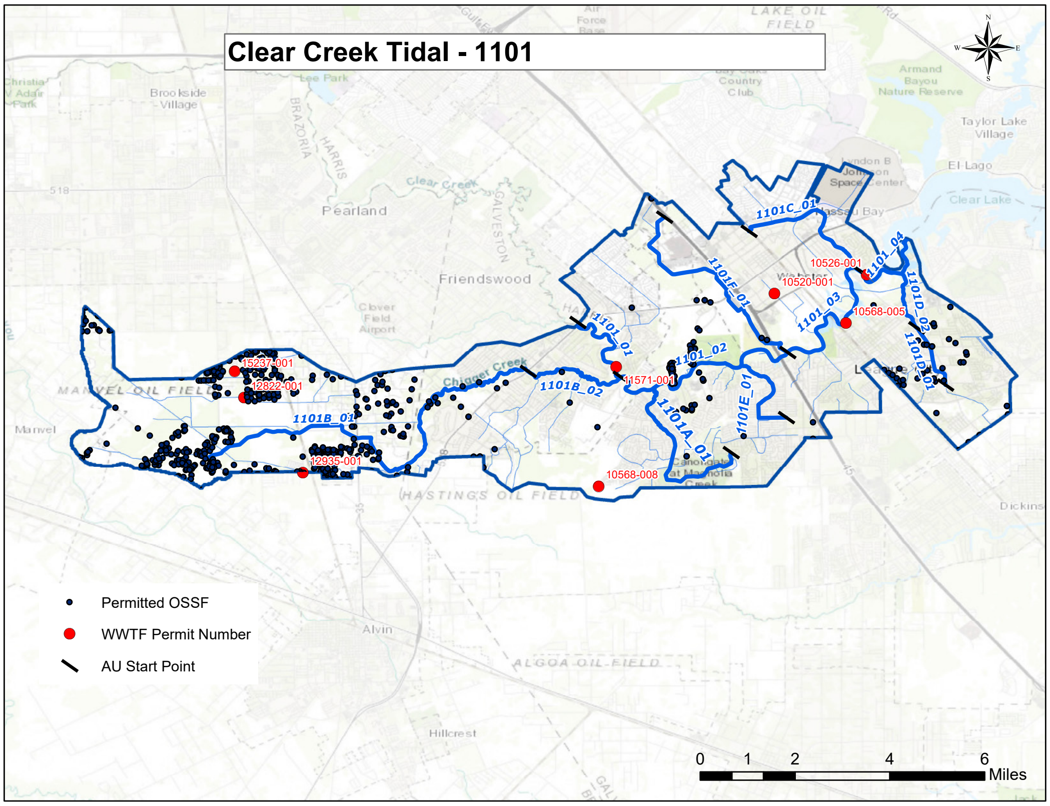

Armand Bayou Tidal - 1113
Permited OSSF
WWTF
AU Start Point
0 1 2 4 Miles

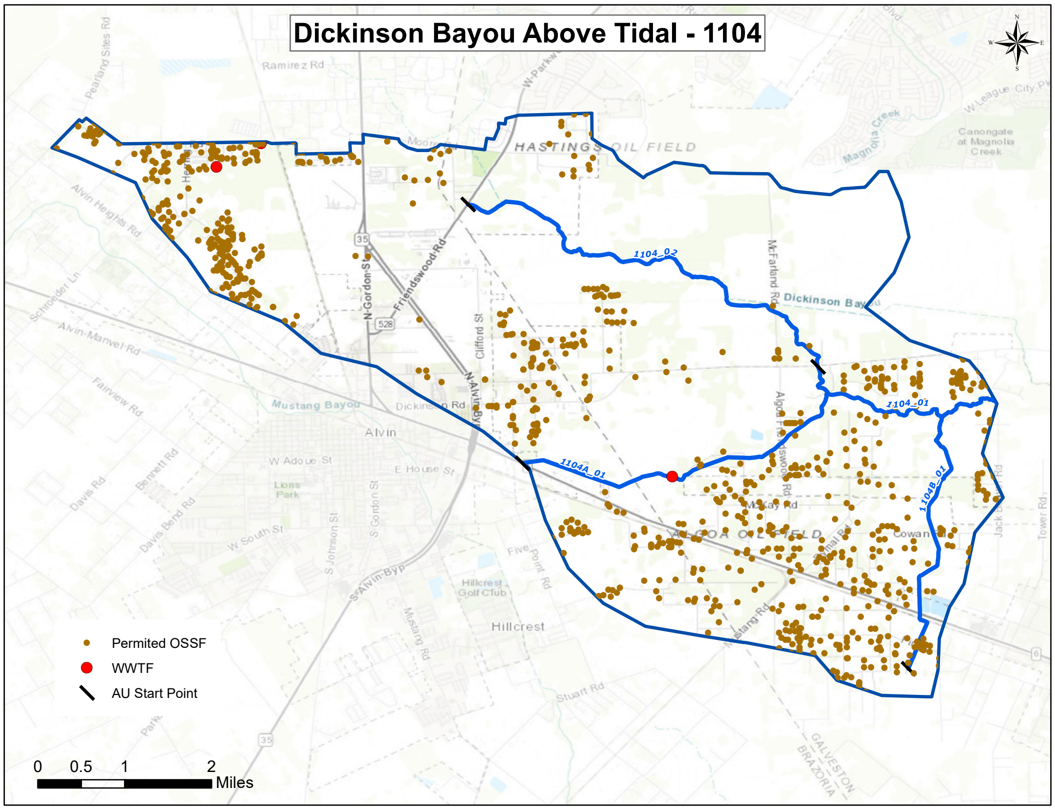

Bastrop Bayou Tidal - 1105
Permited OSSF
WWTF
AU Start Point
0 2 4 8 Miles

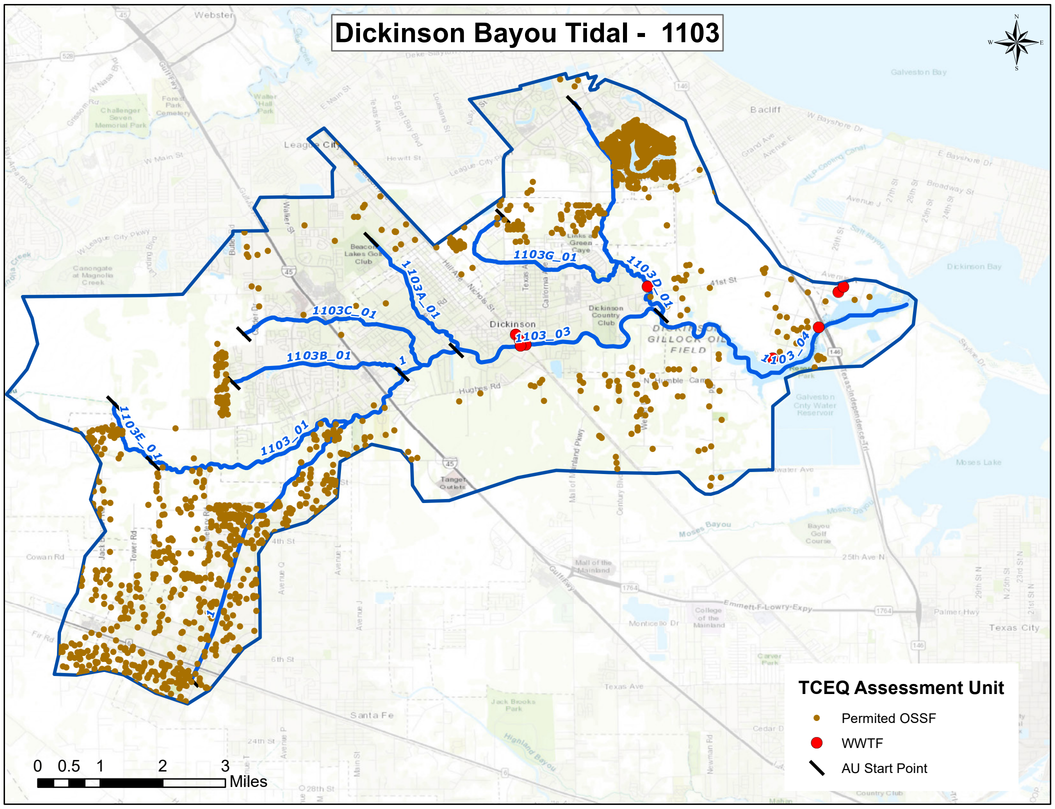

Chocolate Bayou Above Tidal - 1108
Permited OSSF
AU Start Point
WWTF
0
1.25
2.5
5
Miles
Arcola
MANVEL OIL FIELD
Manvel
Alvin
Iowa Colony
Bonney
Liverpool

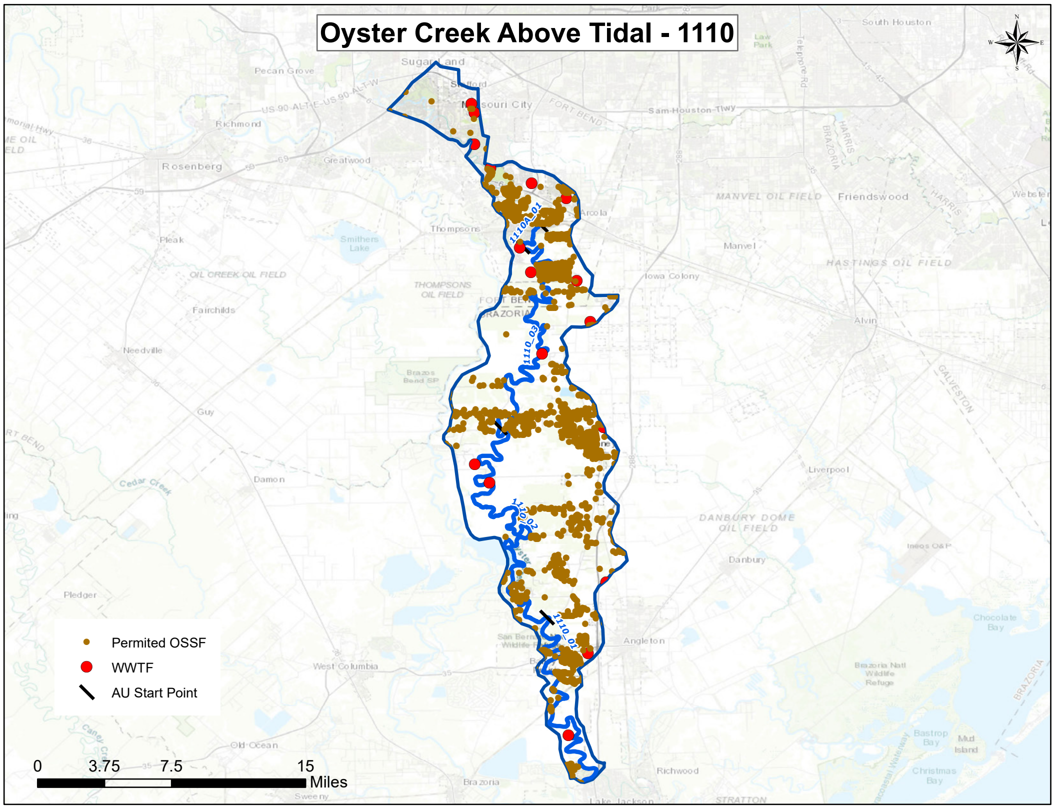

Chocolate Bayou Tidal - 1107
Permited OSSF
WWTF
AU Start Point
0
0.75
1.5
3
Miles
Liverpool
DANBURY DOME OIL FIELD
Duck Lake
1107_01

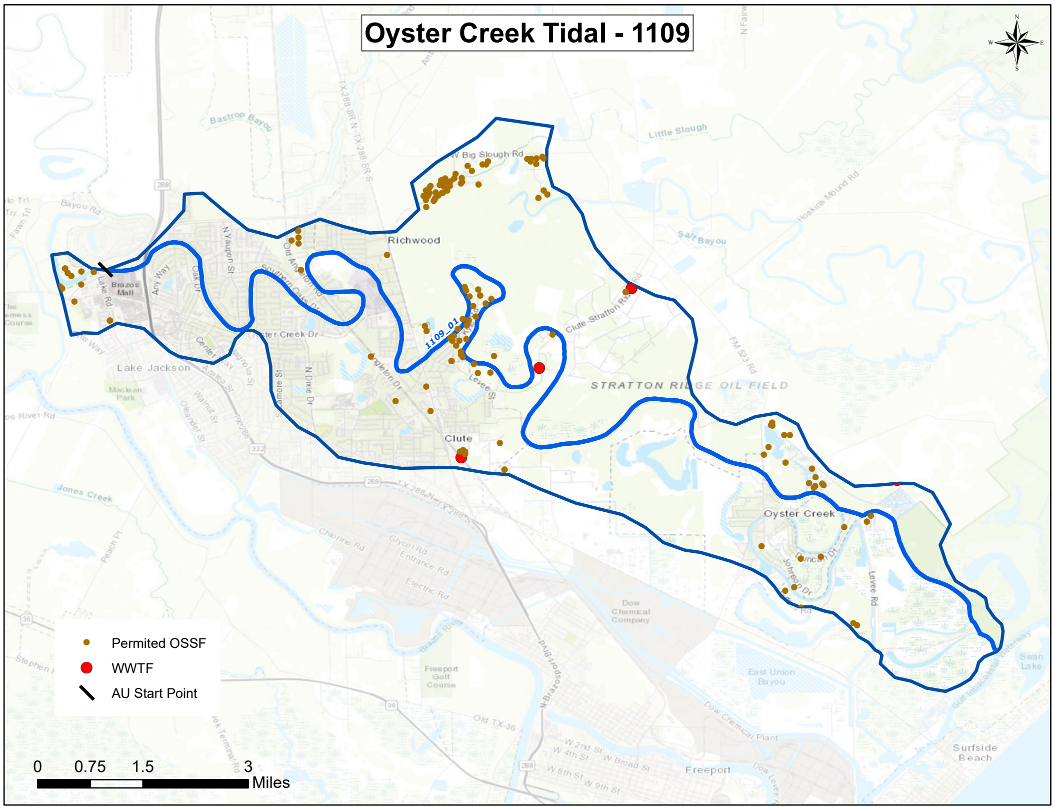

Clear Creek Above Tidal - 1102
Permited OSSF
WWTF Permit Number
AU Start Point
0 0.5 1 2 3 4
Miles
1102_01
1102_02
1102C_01
1102B_01
1102G_01
1102_03
1102_04
1102_05
1102D_01
1102E_01
1102A_01
1102A_02
10495-079
10495-075
12939-001
03593-000
10134-008
12295-001
12849-001
10134-002
10134-007
10134-010
12680-001
12332-001
Pearland
Friendswood
Sims Bayou
Mustang Bayou
Chocolate Bayou
Chigger Creek
MANVEL OIL FIELD
HASTINGS OIL FIELD
Manvel
Arcola
Fresno
Iowa Colony
Alvin
South Houston

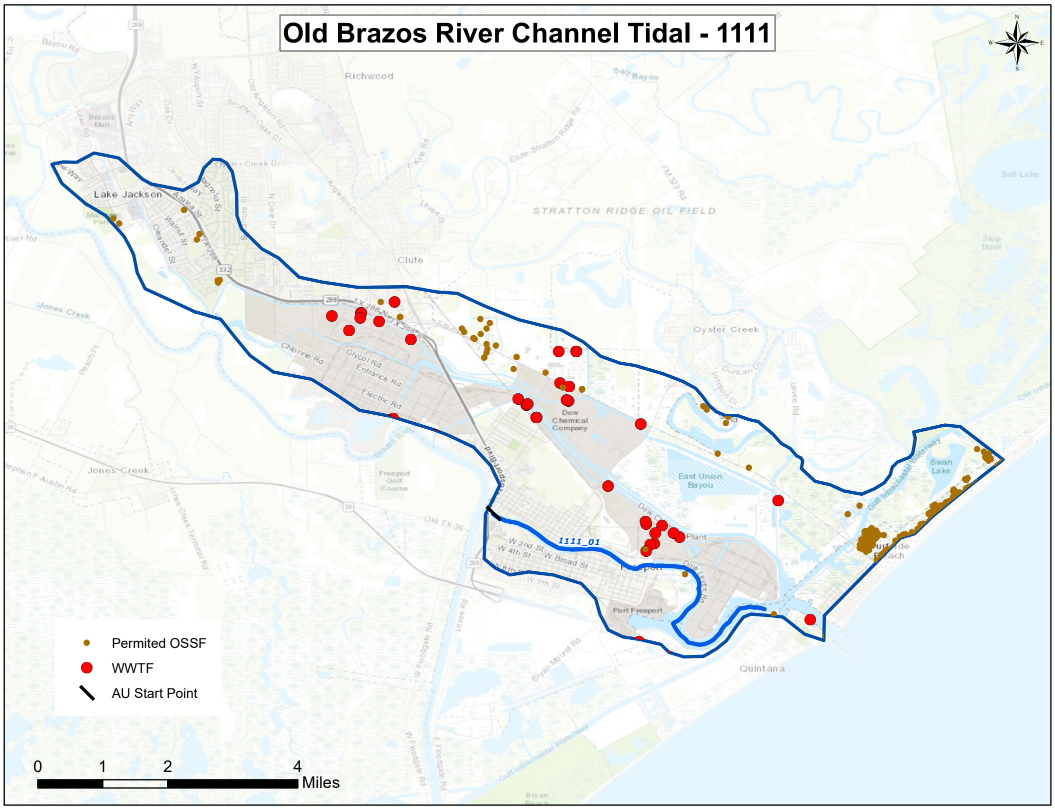

Clear Creek Tidal - 1101
Permitted OSSF
WWTF Permit Number
AU Start Point
0 1 2 4 6
Miles
1101C_01
1101F_01
1101_01
1101_02
1101_03
1101_04
1101B_01
1101B_02
1101A_01
1101E_01
1101D_01
1101D_02
10526-001
10520-001
10568-005
11571-001
10568-008
15237-001
12822-001
12935-001
Pearland
Friendswood
Brookside Village
Manvel
Alvin
Hillcrest
Dickinson
Taylor Lake Village
El Lago
Clear Lake
Chigger Creek
Clear Creek
MANVEL OIL FIELD
HASTINGS OIL FIELD
ALGOA OIL FIELD
Armand Bayou Nature Reserve


Dickinson Bayou Above Tidal - 1104
1104_02
1104_01
1104A_01
1104B_01
Dickinson Bayou
HASTINGS OIL FIELD
Alvin
Hillcrest
Permited OSSF
WWTF
AU Start Point
0 0.5 1 2 Miles

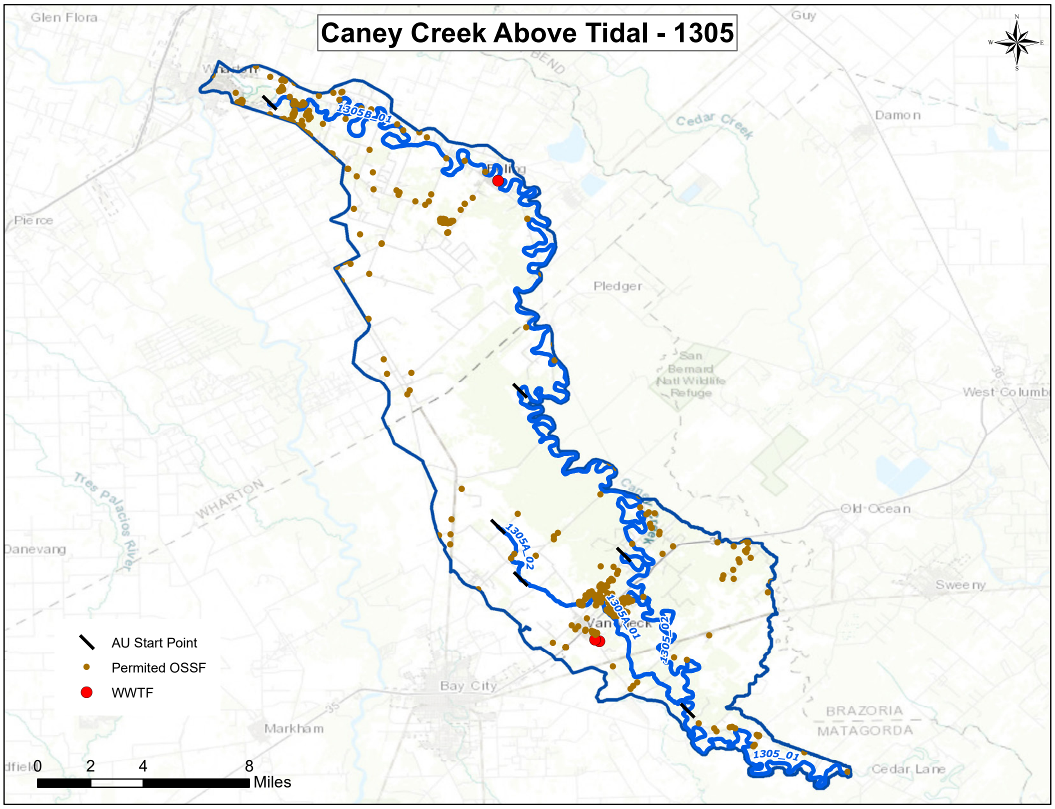

Dickinson Bayou Tidal - 1103
1103G_01
1103D_01
1103A_01
1103C_01
1103B_01
1103_03
1103_01
1103E_01
Dickinson
TCEQ Assessment Unit
Permited OSSF
WWTF
AU Start Point
0 0.5 1 2 3 Miles

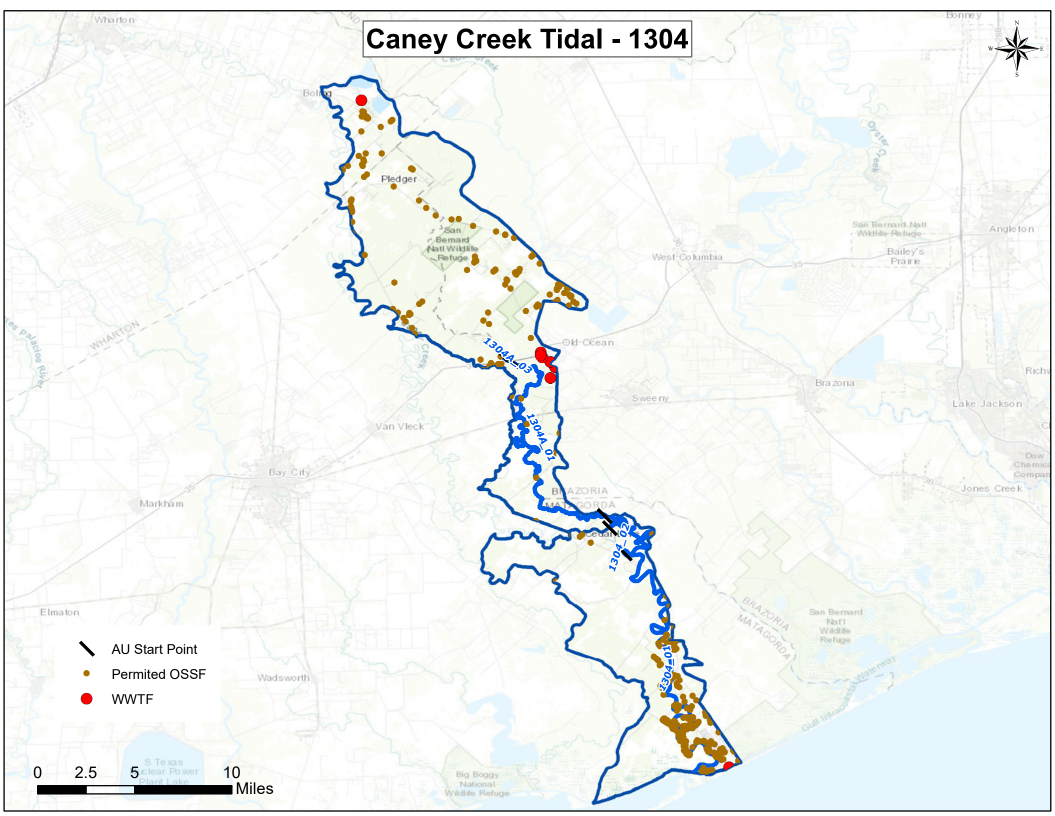

Oyster Creek Above Tidal - 1110
Permited OSSF
WWTF
AU Start Point
0
3.75
7.5
15
Miles
1110_01
1110_03
1110_02

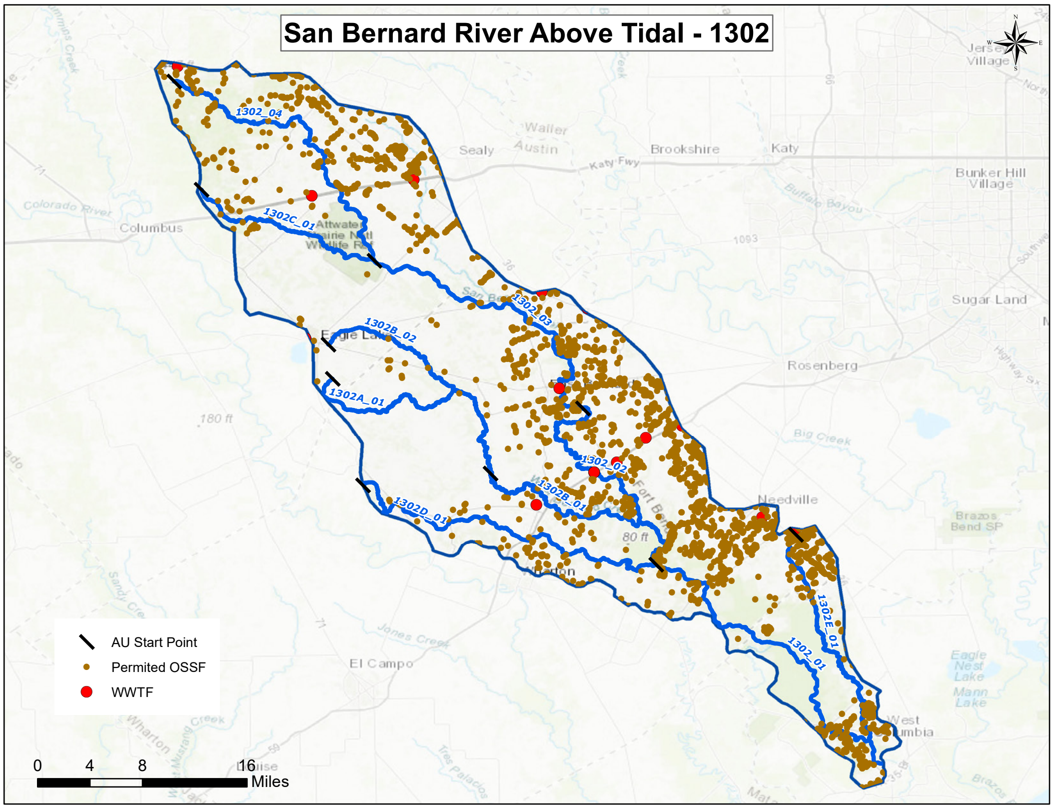

Oyster Creek Tidal - 1109
Permited OSSF
WWTF
AU Start Point
0
0.75
1.5
3
Miles
1109_01
Richwood
Clute
Lake Jackson
Oyster Creek
STRATTON RIDGE OIL FIELD
Freeport

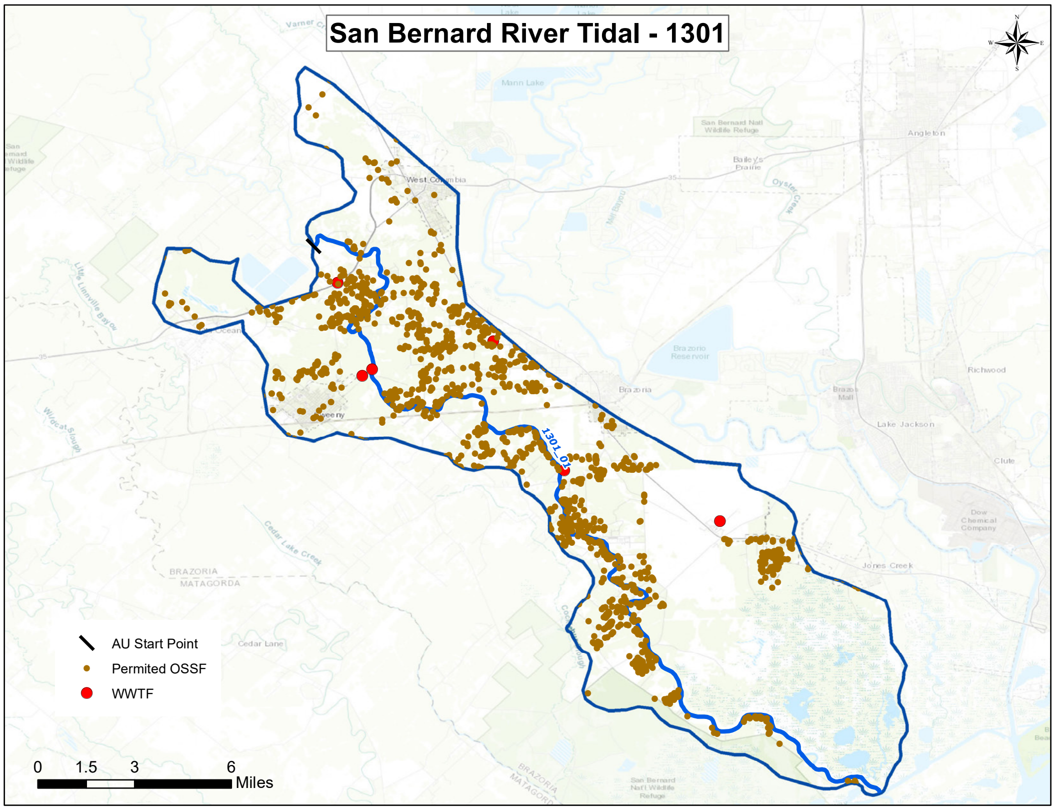


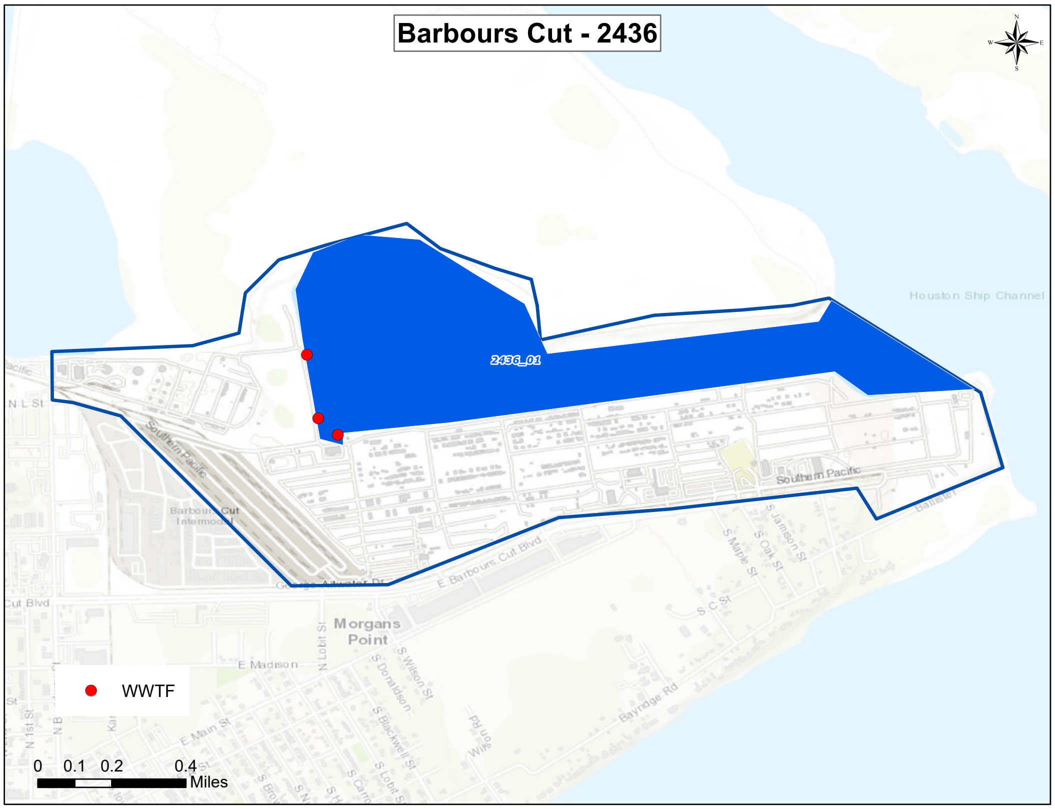
Old Brazos River Channel Tidal - 1111
Permited OSSF
WWTF
AU Start Point
0
1
2
4
Miles
1111_01
Lake Jackson
Richwood
Clute
Oyster Creek
Jones Creek
STRATTON RIDGE OIL FIELD
Dow Chemical Company
East Union Bayou
Port Freeport
Quintana
Swan Lake
Salt Lake

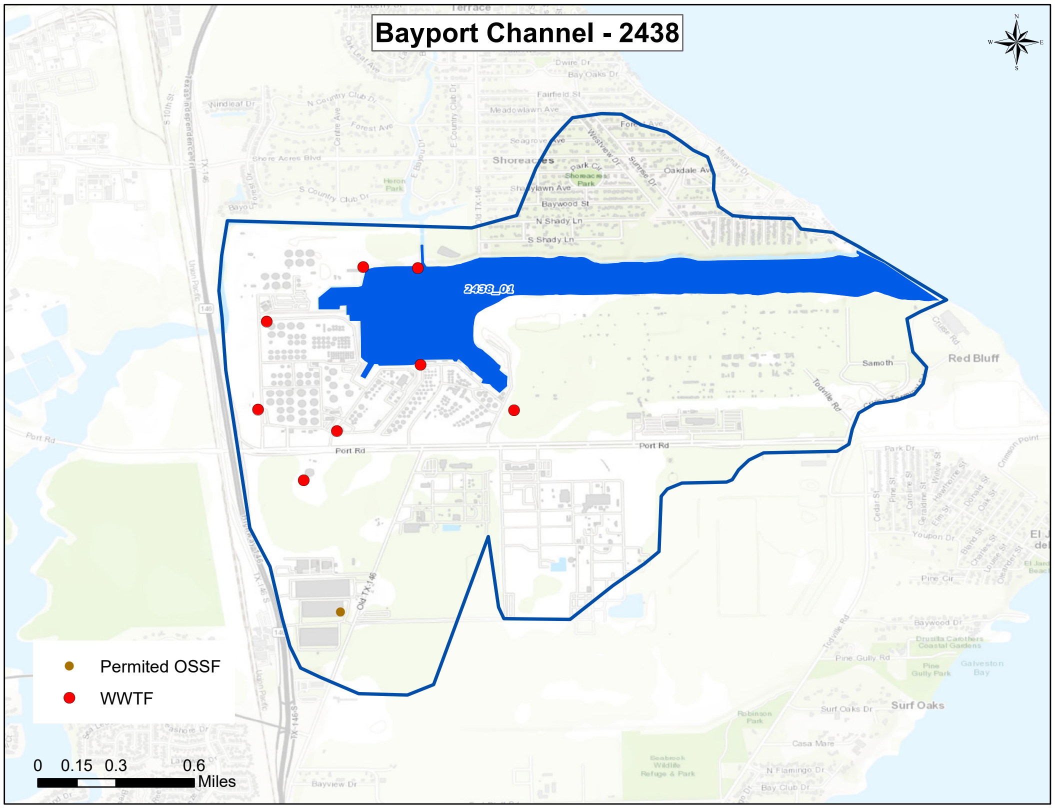

Caney Creek Above Tidal - 1305
Glen Flora
Guy
Damon
Cedar Creek
Pierce
Pledger
San Bernard Natl Wildlife Refuge
West Columb
Tres Palacios River
WHARTON
Old Ocean
Danevang
Sweeny
Van Vleck
Bay City
Markham
BRAZORIA
MATAGORDA
Cedar Lane
1305B_01
1305A_02
1305A_01
1305_02
1305_01
AU Start Point
Permited OSSF
WWTF
0
2
4
8
Miles

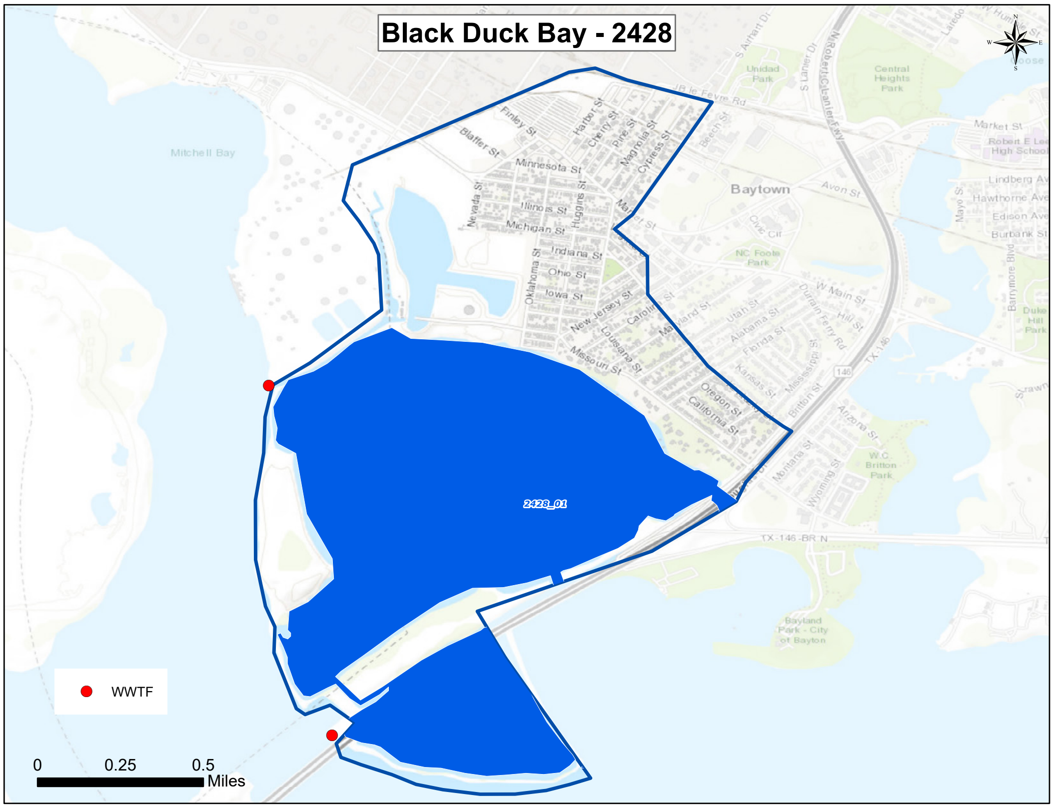

Caney Creek Tidal - 1304
Wharton
Pledger
San Bernard Natl Wildlife Refuge
West Columbia
Angleton
WHARTON
Old Ocean
Sweeny
Brazoria
Lake Jackson
Van Vleck
Bay City
Markham
BRAZORIA
MATAGORDA
Jones Creek
Elmaton
Wadsworth
1304A_02
1304A_01
1304_01
AU Start Point
Permited OSSF
WWTF
0
2.5
5
10
Miles

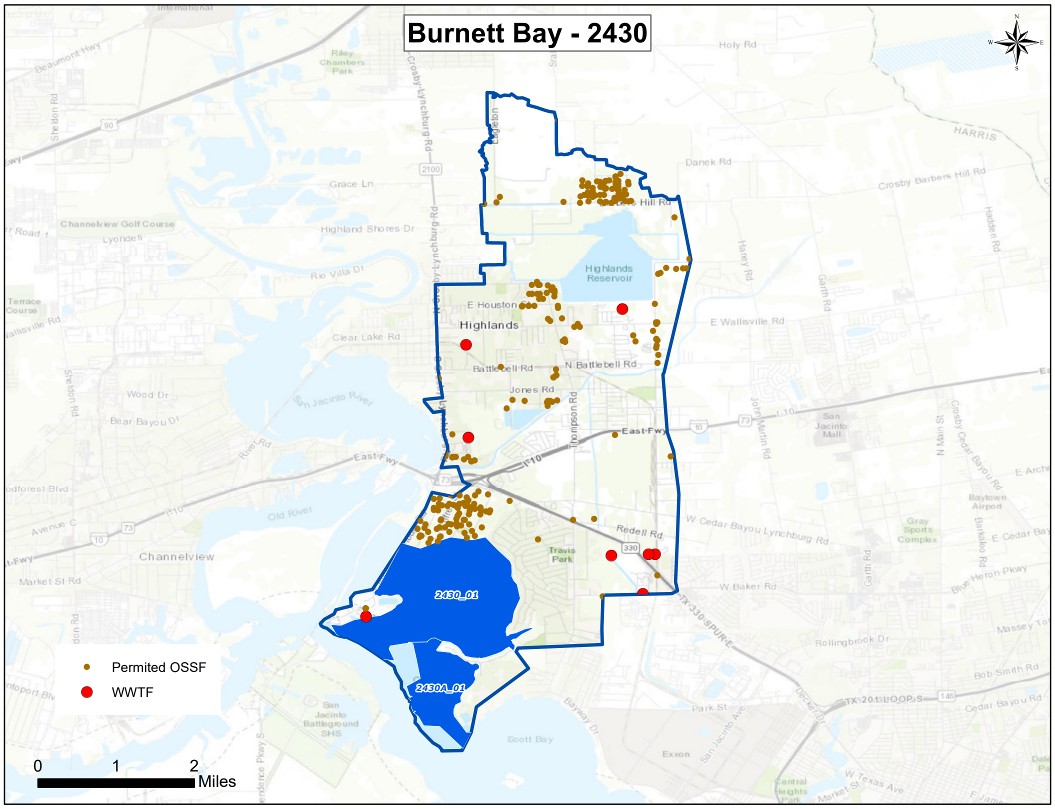

San Bernard River Above Tidal - 1302
AU Start Point
Permited OSSF
WWTF
0 4 8 16 Miles

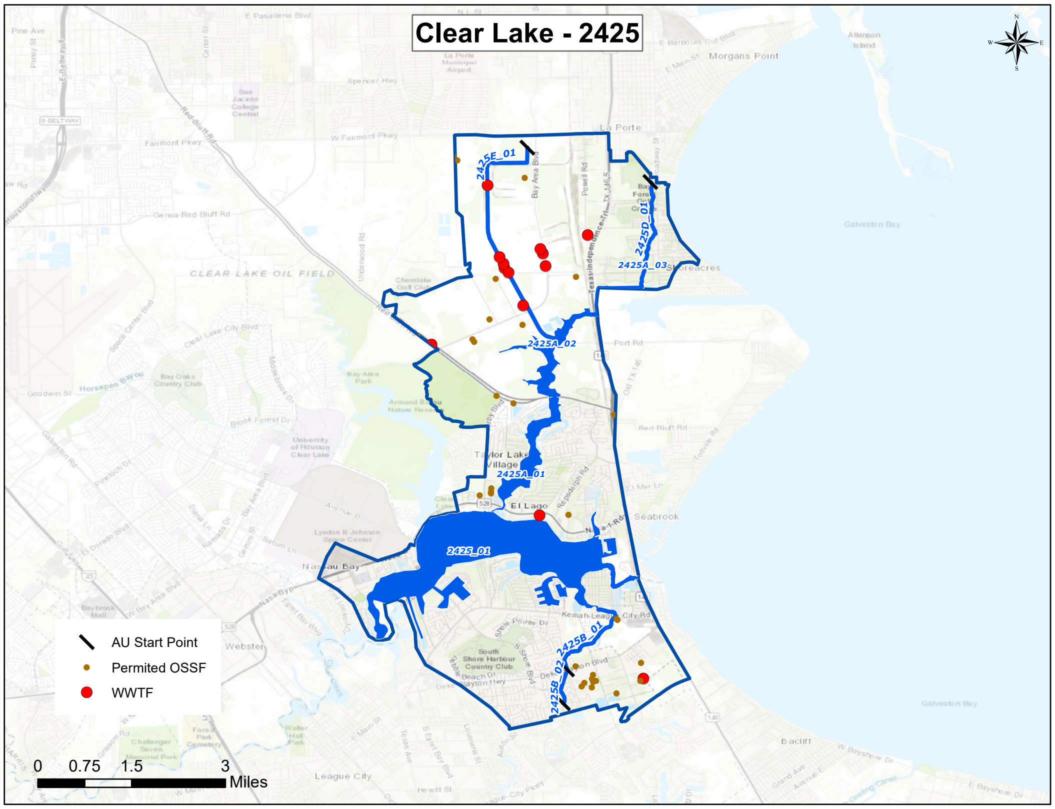

San Bernard River Tidal - 1301
AU Start Point
Permited OSSF
WWTF
0 1.5 3 6 Miles

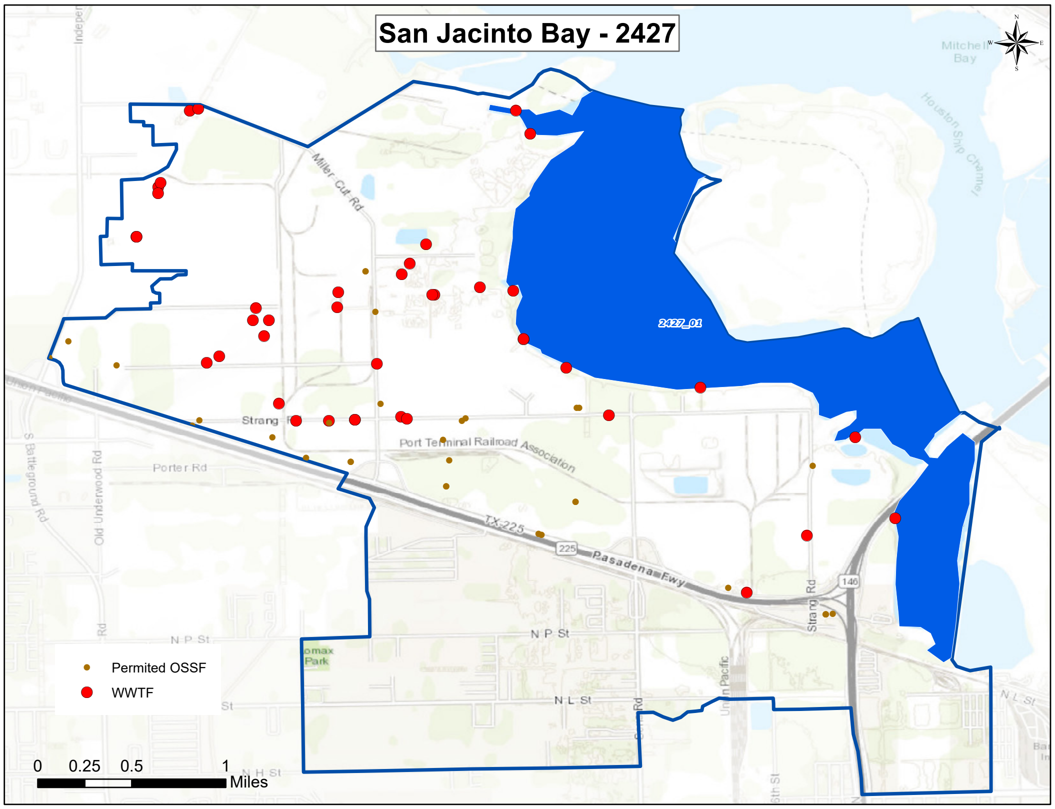

Barbours Cut - 2436
2436_01
Houston Ship Channel
Southern Pacific
Morgans Point
E Barbours Cut Blvd
WWTF
0 0.1 0.2 0.4
Miles

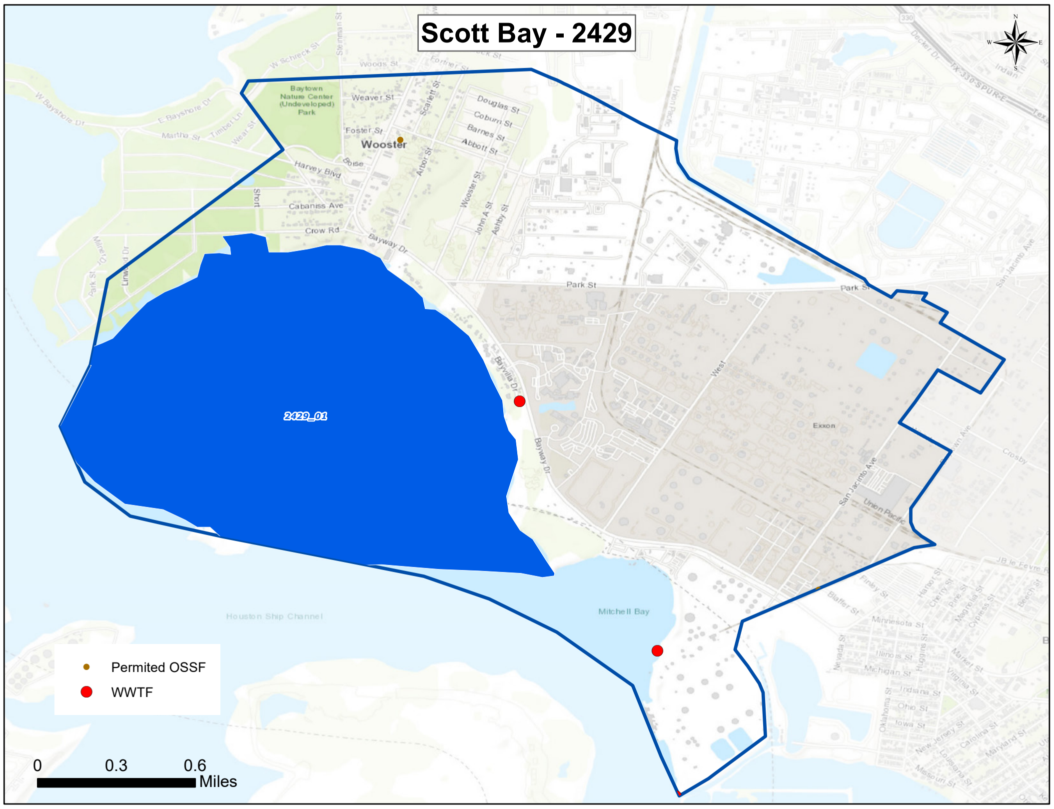

Bayport Channel - 2438
2438_01
Shoreacres
Red Bluff
Port Rd
Surf Oaks
Permited OSSF
WWTF
0 0.15 0.3 0.6
Miles

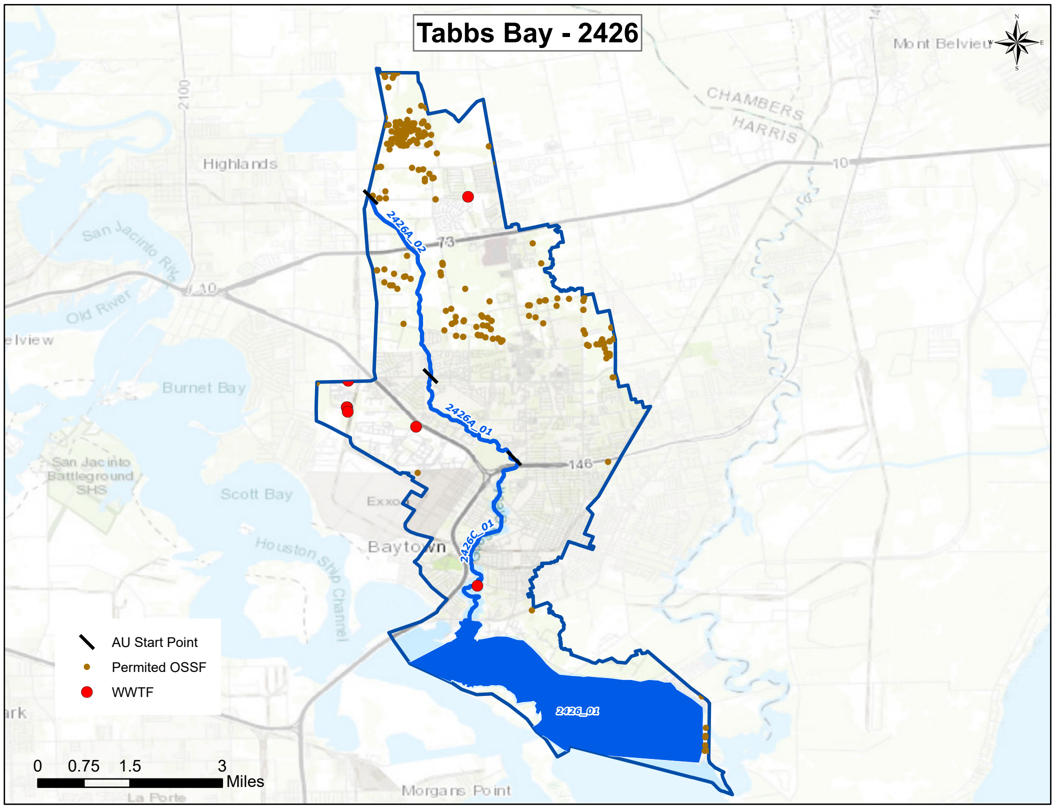

Black Duck Bay - 2428
2428_01
WWTF
0
0.25
0.5
Miles
Baytown

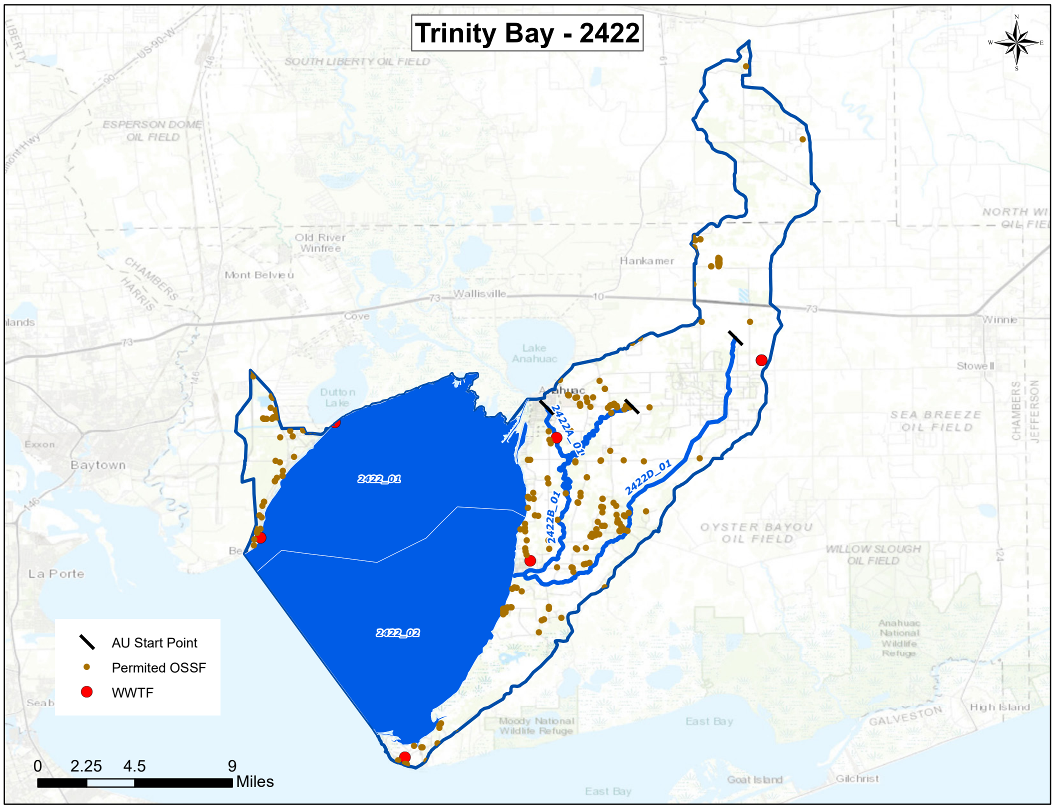

Burnett Bay - 2430
2430_01
2430A_01
Permited OSSF
WWTF
0
1
2
Miles
Highlands
Highlands Reservoir
Channelview


Clear Lake - 2425
AU Start Point
Permited OSSF
WWTF
0 0.75 1.5 3
Miles
2425A_01
2425A_02
2425A_03
2425B_01
2425B_02
2425_01

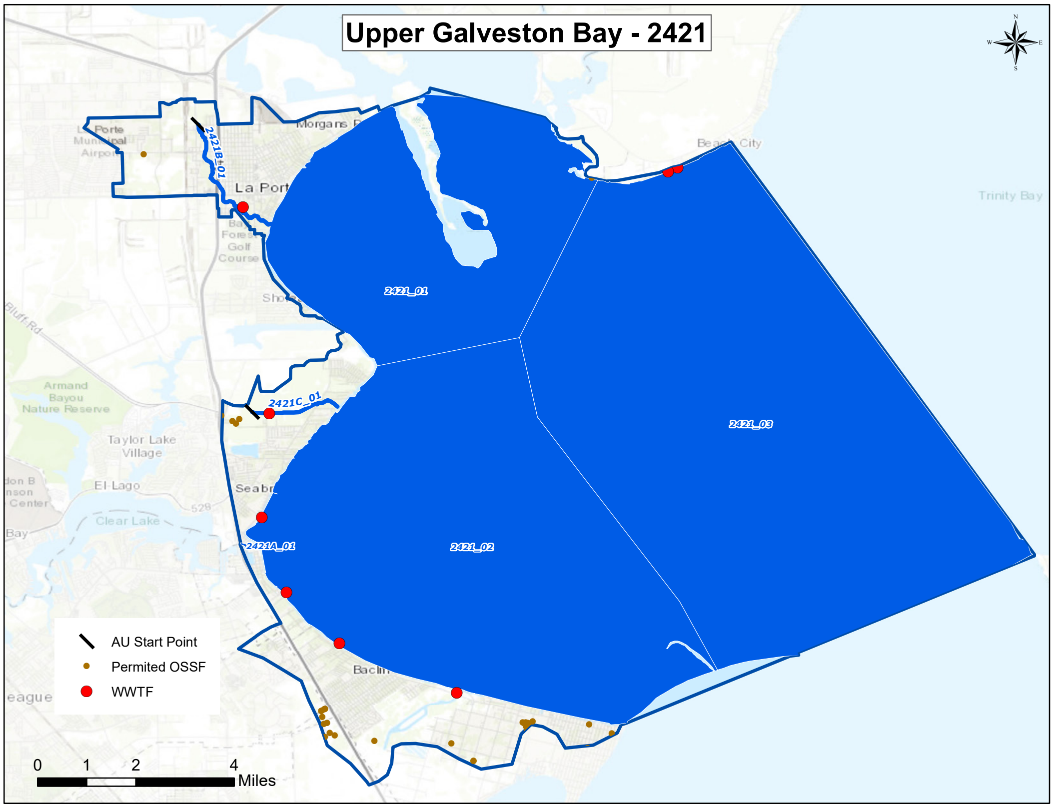

San Jacinto Bay - 2427
Permited OSSF
WWTF
0 0.25 0.5 1
Miles
2427_01

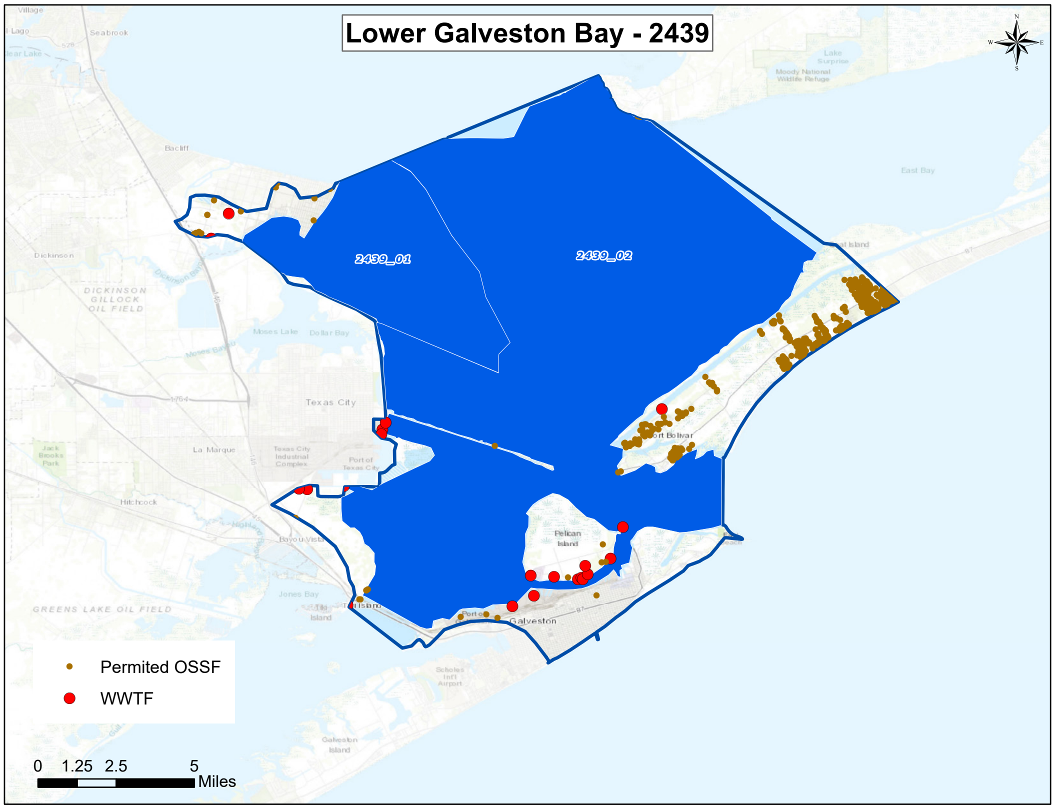

Scott Bay - 2429
Wooster
2429_01
Mitchell Bay
Houston Ship Channel
Exxon
Permited OSSF
WWTF
0
0.3
0.6
Miles

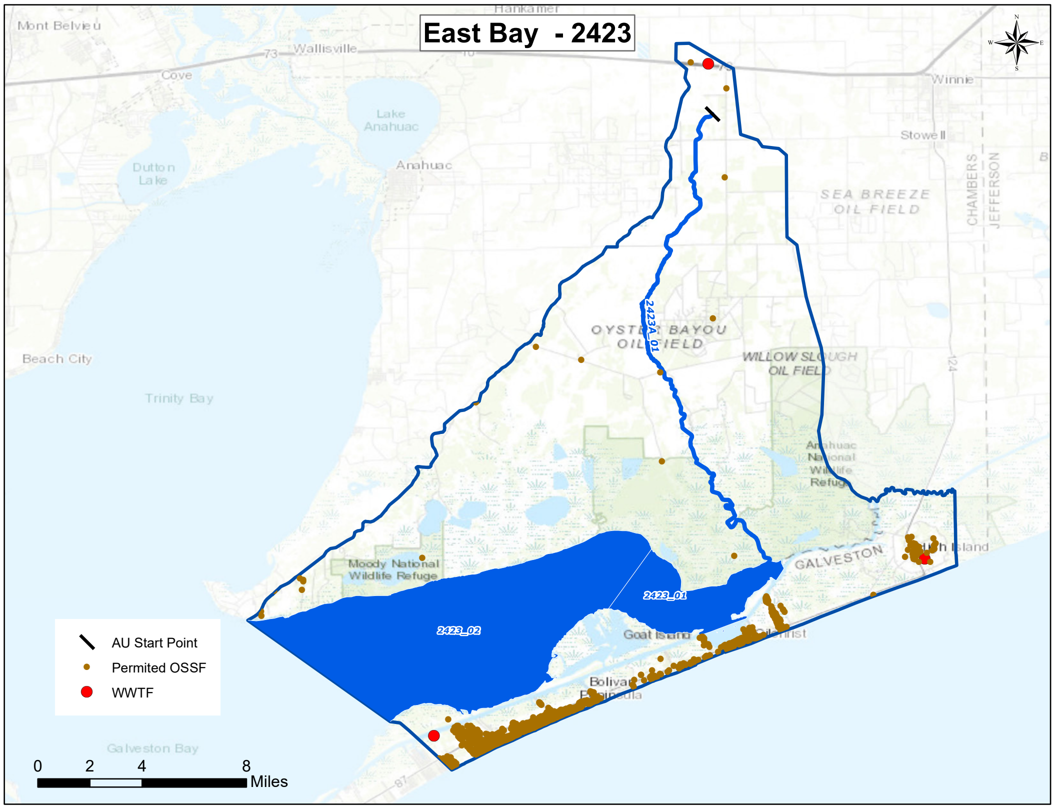

Tabbs Bay - 2426
Mont Belvieu
CHAMBERS
HARRIS
Highlands
San Jacinto Riv
Old River
Burnet Bay
San Jacinto Battleground SHS
Scott Bay
Houston Ship Channel
Baytown
2426A_02
2426A_01
2426C_01
2426_01
Morgans Point
La Porte
AU Start Point
Permited OSSF
WWTF
0
0.75
1.5
3
Miles

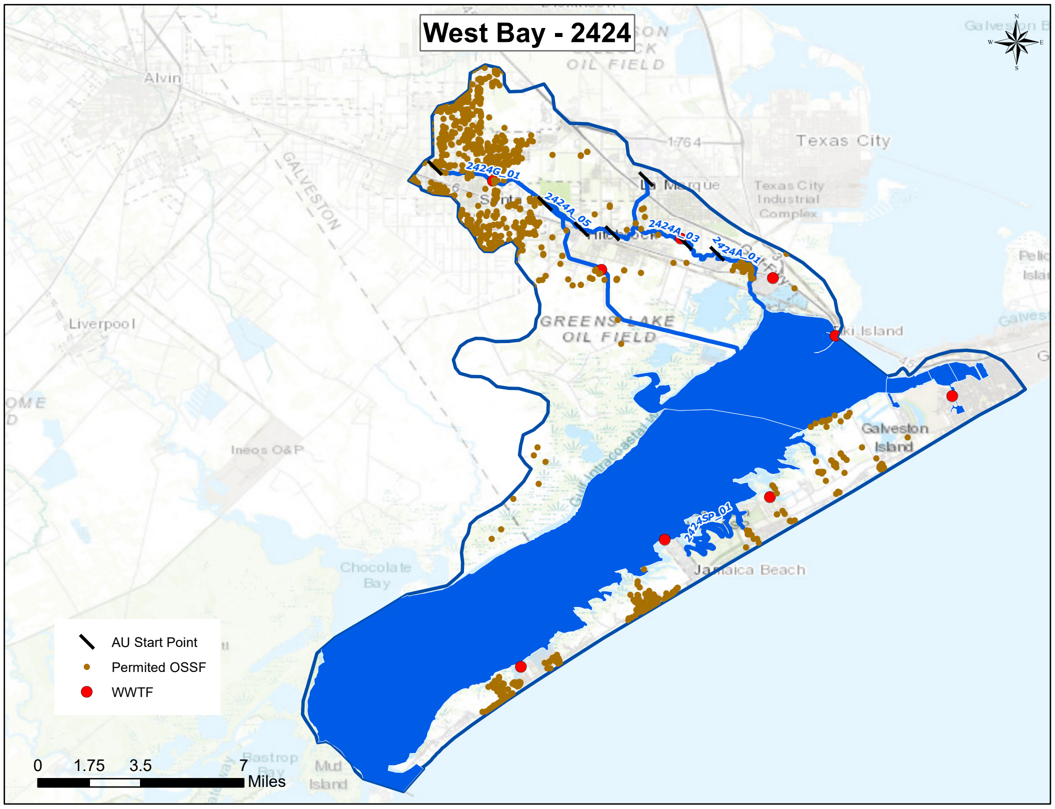


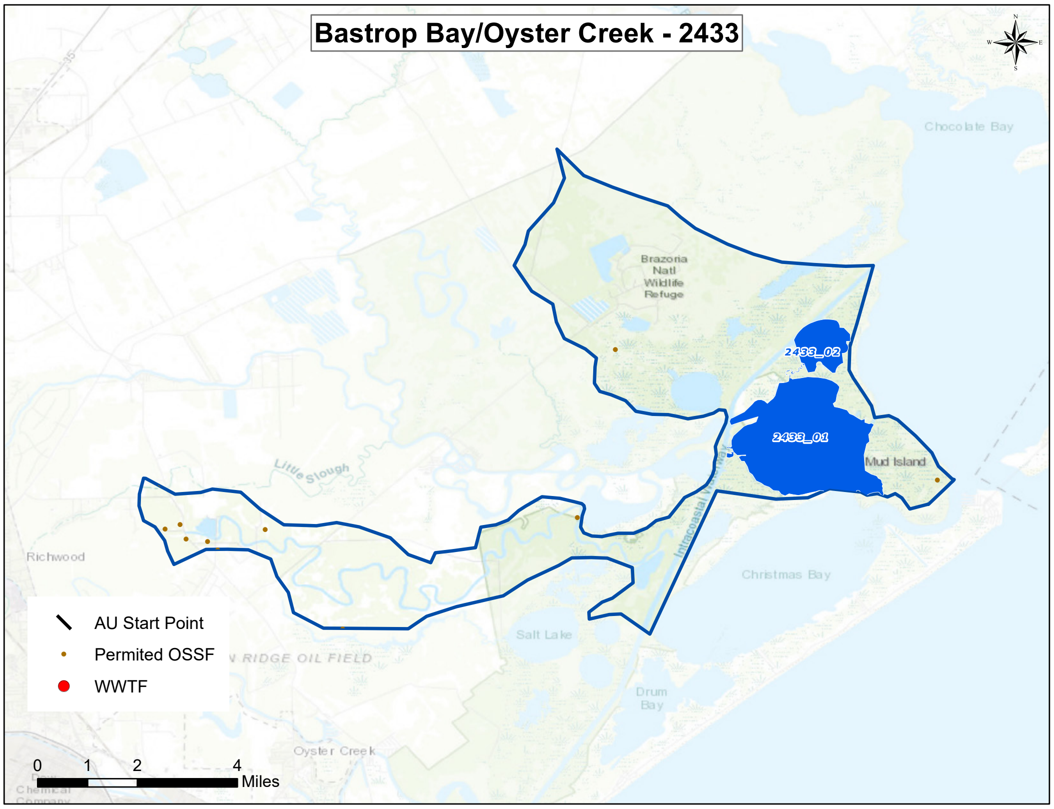
Trinity Bay - 2422
2422_01
2422_02
2422A_01
2422B_01
2422D_01
AU Start Point
Permited OSSF
WWTF
0 2.25 4.5 9
Miles

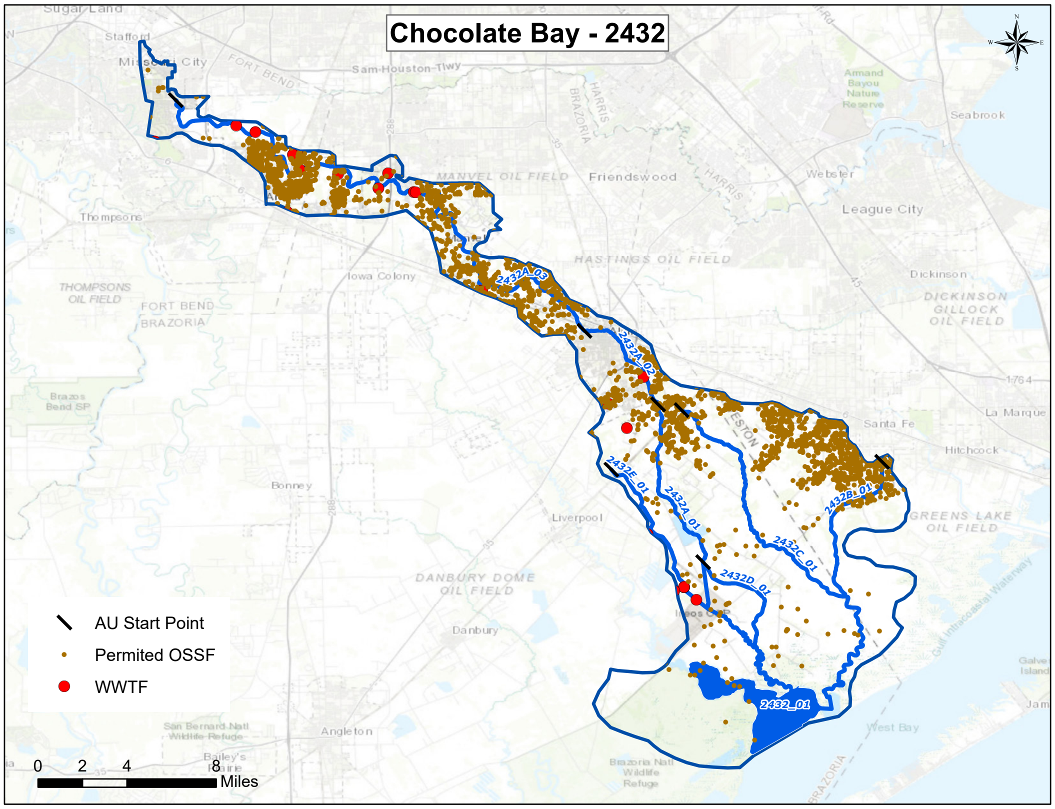

Upper Galveston Bay - 2421
2421B_01
2421C_01
2421_01
2421_02
2421_03
2421A_01
AU Start Point
Permited OSSF
WWTF
0 1 2 4 Miles

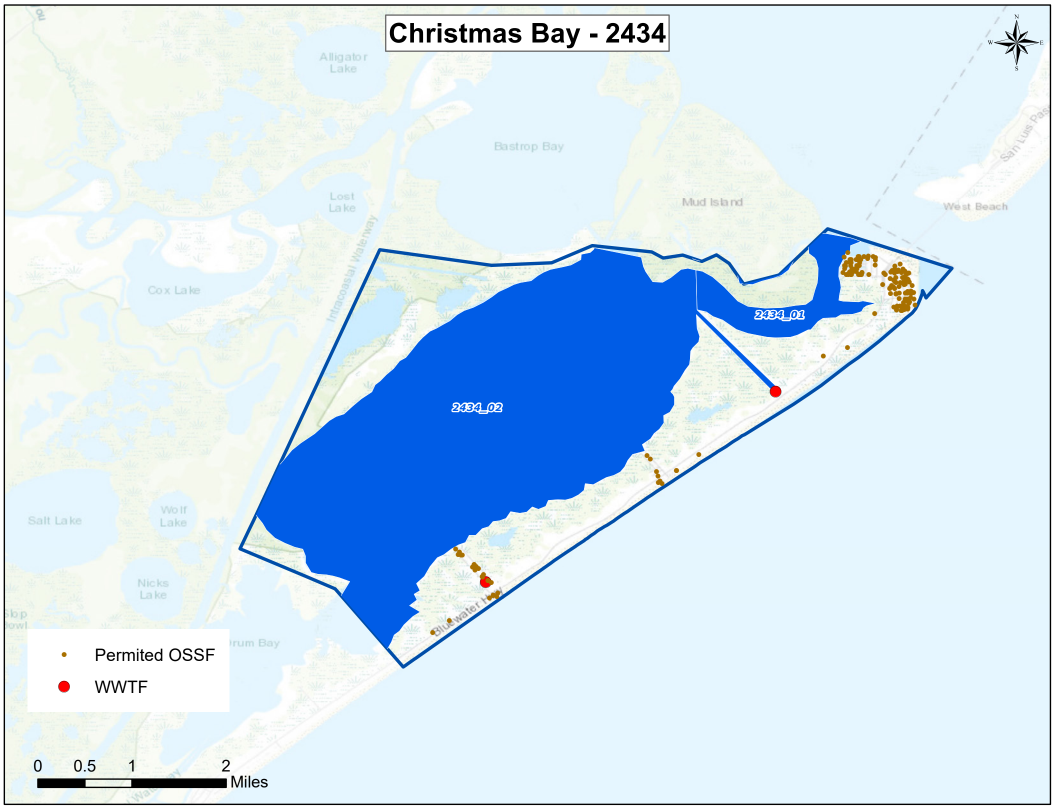

Lower Galveston Bay - 2439
2439_01
2439_02
Permited OSSF
WWTF
0 1.25 2.5 5 Miles

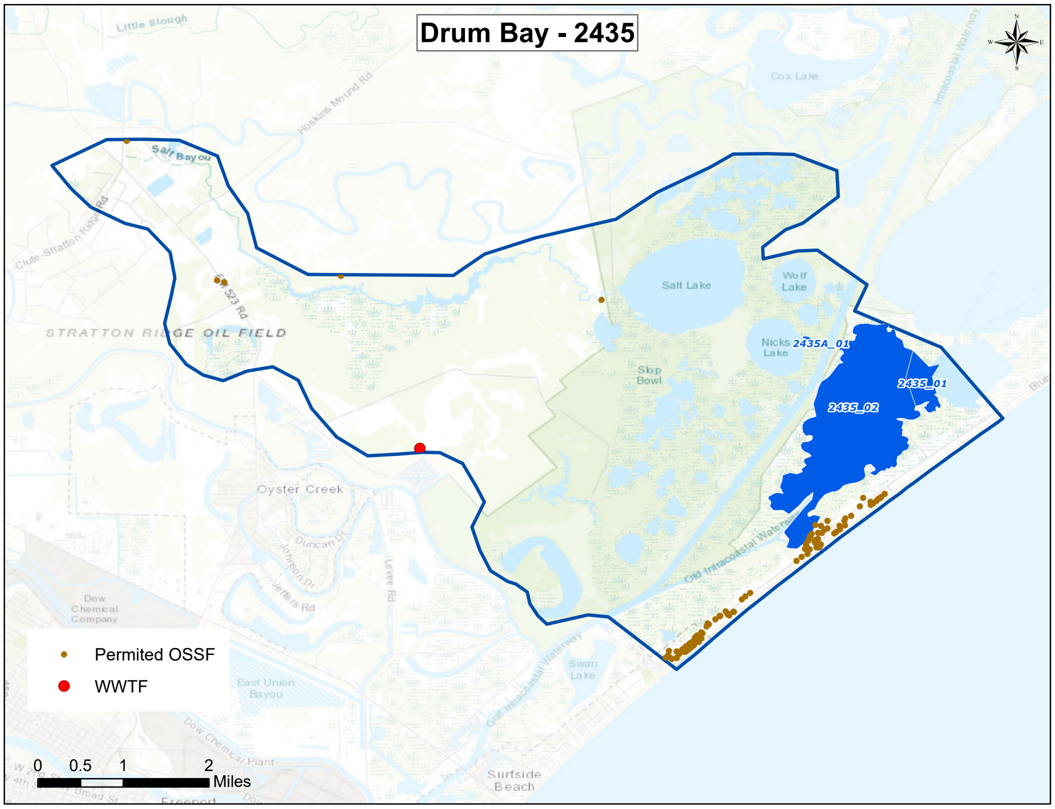

East Bay - 2423
2423A_01
2423_01
2423_02
AU Start Point
Permited OSSF
WWTF
0 2 4 8 Miles

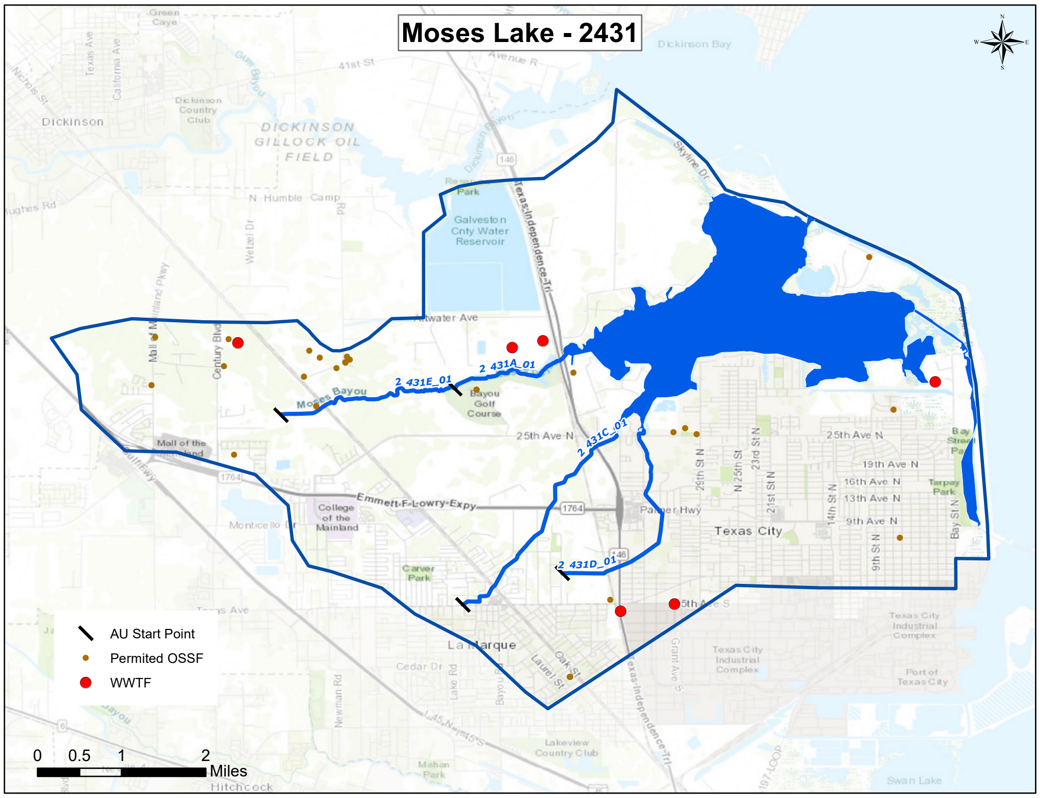

West Bay - 2424
2424G_01
2424A_05
2424A_03
2424A_01
AU Start Point
Permited OSSF
WWTF
0 1.75 3.5 7 Miles

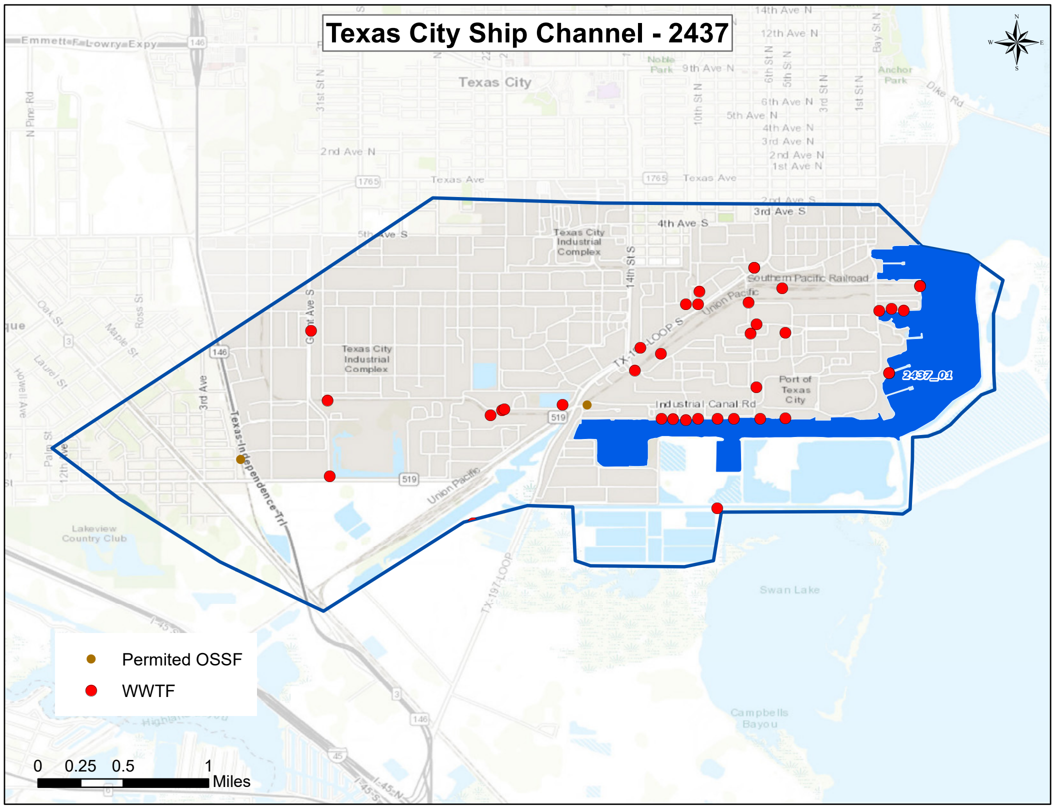

Bastrop Bay/Oyster Creek - 2433
2433_02
2433_01
Mud Island
Brazoria Natl Wildlife Refuge
Chocolate Bay
Christmas Bay
Salt Lake
Drum Bay
Oyster Creek
Richwood
Little Slough
AU Start Point
Permited OSSF
WWTF
0 1 2 4
Miles

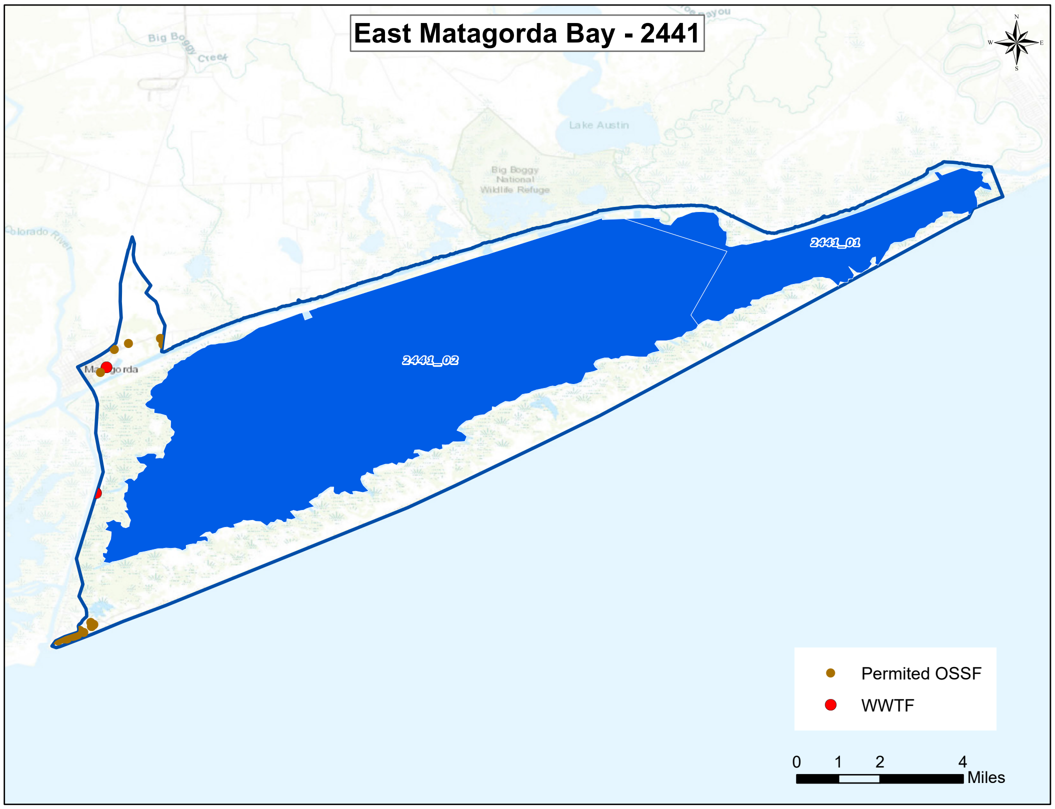

Chocolate Bay - 2432
2432A_03
2432A_02
2432A_01
2432E_01
2432D_01
2432C_01
2432B_01
2432_01
AU Start Point
Permited OSSF
WWTF
0 2 4 8
Miles

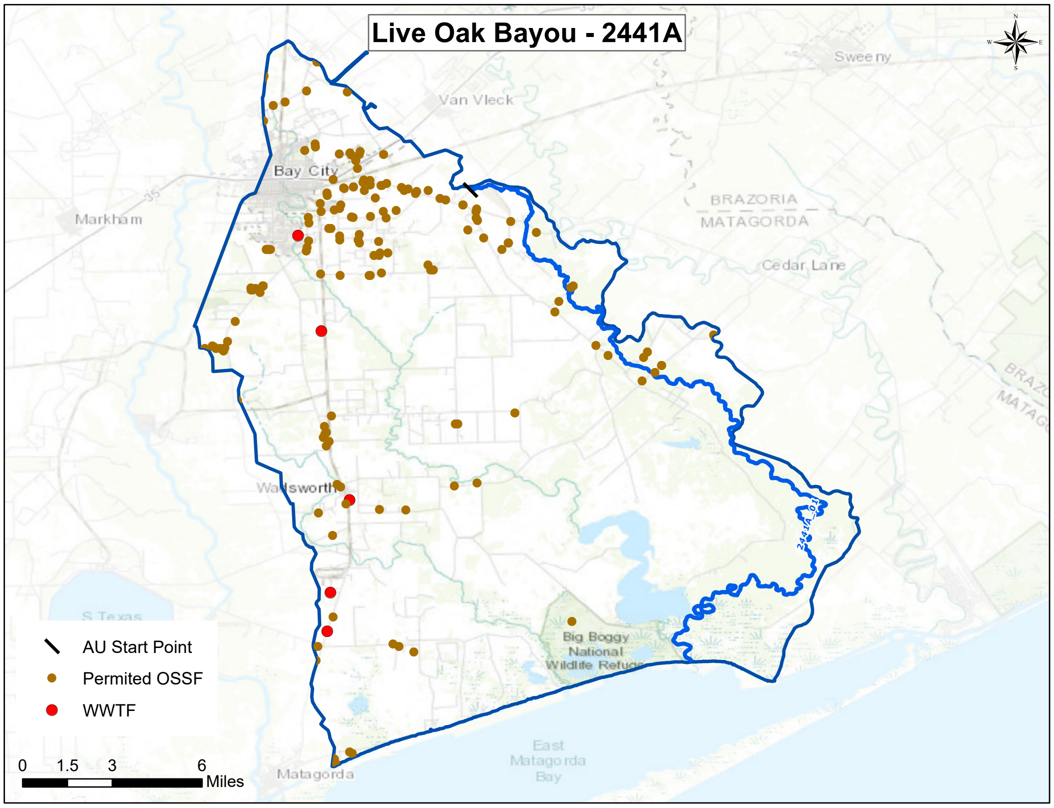

Christmas Bay - 2434
2434_01
2434_02
Permited OSSF
WWTF
0 0.5 1 2
Miles
Alligator Lake
Bastrop Bay
Lost Lake
Mud Island
West Beach
Cox Lake
Salt Lake
Wolf Lake
Nicks Lake


Drum Bay - 2435
2435A_01
2435_01
2435_02
Permited OSSF
WWTF
0 0.5 1 2
Miles
Little Slough
Salt Bayou
STRATTON RIDGE OIL FIELD
Salt Lake
Wolf Lake
Nicks Lake
Slop Bowl
Cox Lake
Oyster Creek
Dow Chemical Company
East Union Bayou
Swan Lake
Surfside Beach


Moses Lake - 2431
AU Start Point
Permited OSSF
WWTF
0 0.5 1 2 Miles


Texas City Ship Channel - 2437
Permited OSSF
WWTF
0 0.25 0.5 1 Miles


East Matagorda Bay - 2441
2441_01
2441_02
Matagorda
Lake Austin
Permited OSSF
WWTF
0 1 2 4
Miles


Live Oak Bayou - 2441A
Sweeny
Van Vleck
Bay City
Markham
BRAZORIA
MATAGORDA
Cedar Lane
Wadsworth
Big Boggy
National
Wildlife Refuge
East
Matagorda
Bay
Matagorda
AU Start Point
Permited OSSF
WWTF
0 1.5 3 6
Miles

APPENDIX D - Task 6: WQMP Update / Final Report Documentation and Comments

The following Contract Deliverables were submitted electronically with this report:

- Documentation of Public Participation
- Comments received on the 2021 Water Quality Management Plan Update Report
- Response to comments on the 2021 Water Quality Management Plan Update Report

Documentation of Participation in the WQMP Update

- To ensure the public has an opportunity to participate in the WQMP Update and provide comments on the report, a 30-day public comment period was available. This comment period opened on 7/1/21.
- The Draft WQMP Update Report was sent electronically to members of the Natural Resources Advisory Committee (NRAC) for review and comment on 7/1/21.
- The Draft WQMP Update Report document was posted on H-GAC's website for public review and comment.
- The Public Comment period closed on 7/31/21.
- The Draft WQMP Update Report was updated to address public comments and comments from the NRAC.
- The Final WQMP Update Report, incorporating comments submitted by the public and NRAC, was presented to the NRAC on 8/5/21 as part of a public meeting.
- The Final WQMP Update Report was submitted to the H-GAC Board of Directors for acceptance on 8/17/21.
- The Final WQMP Update Report was submitted to TCEQ for certification on 8/31/21.

Public Comments on WQMP Update

From	Page #	Comment	Response
Stuart Mueller Harris County Pollution Control	20	Last paragraph left column, PCS also monitors effluent for compliance with WQ permits	A reference to TCEQ and PCS's inspection and enforcement programs was included.
	21	1st paragraph and Table 1, paragraph notes 1243 permitted outfalls, Table 1 notes 1243 permittees. recommend clarification.	The text has been corrected to reflect that "permittees" is the correct term.
	21	General question is there benefit to breaking down and noting data by county?	This is something that H-GAC would like to implement for future WQMP projects. It was not possible to do so this year due to the level of resources that needed to be allocated to the Basin Summary Report. However, we were able to incorporate some of the information gathered under the Basin Summary Report, such as the maps of WWTFs and OSSFs by watershed (included in Appendix C), that can be the foundation for this county-level approach in the future.
	39	2nd paragraph left column, "-" missing in H GAC	This has been corrected.
	53	Table 22 title, should FY 20 be FY 21?	Yes, this should be FY 21. This has been corrected.

From	Page #	Comment	Response
Tom Douglas Houston Sierra Club	7	The abbreviation for Inflow and Infiltration is shown as "I&!" instead of the intended "I&I".	Corrected typo.
	7	At some point in the WQMP Update document, it would be appropriate to define the terms "inflow" and "infiltration" in the text.	Added definition on pg 31 on first instance of use.
	11	The final sentence under the heading "Historical Water Quality Management Plan Updates" is difficult to follow. Consider breaking it up into two sentences.	Changed the sentence to a bulleted list for ease in reading.
	12	¶2: Because there are two different primary contact recreation standards, consider saying "primary contact recreation 1 standard".	Added "1" to differentiate that we are referring to the PCR1 standard.
	18	¶3, final sentence: Consider saying ", including wastewater treatment facility discharge"	The text states "The "W" category includes wastewater outfalls ≥1 MGD domestic sewage or process water, including water treatment facility discharge." This comes from the TCEQ definition from the source table. The term water is appropriate because it is referring to discharges such as filter backwash water from surface water treatment facilities.
	20	¶3: Because there are two different primary contact recreation standards, consider saying "primary contact recreation 1 standard".	Added "1" to differentiate that we are referring to the PCR1 standard.
	22	Table 5: The number of Geometric Mean Results Reported and the number of Geometric Mean Results Exceeding Permit Limit for Variable/Intermittent facilities is exactly the same as the number of Daily Maximum or Single Grab Results Reported and the number of Single Grab Results Exceeding Permit Limit for Variable/Intermittent facilities. Is that coincidence? Does it accurately reflect the sampling data reported?	Verified with SAS output with the following source tables: • *Bacteria Permit Exceedance Rates, 2020 – Plants with Permit Limits in EPA Database Only* • *Bacteria Permit Exceedance Rates by Year and Plant Size, 2016 – 2020 DMR Bacteria Data, by Plant Size* • *Bacteria Permit Exceedance Rates by Year and Plant Size, 2016-2020 Daily Maximum or Grab Sample Exceedance Rates* These values are correct. Because of the infrequent discharge at these facilities, one single grab sample exceedance is typically sufficient to cause a geometric mean exceedance as well.

From	Page #	Comment	Response
Tom Douglas Houston Sierra Club	22-23	Table 5: There is a problem with the calculation for the total number of Single Grab Results Exceeding Permit Limit for the year 2020. The total is shown as 109, but the individual entries add up to 188. If 188 is correct, then the percentage would be 2.8%. In the text on page 23, the total number of Single Grab Results Exceeding Permit Limit for the year 2020 is shown as being 190, which would be consistent with the stated 2.9%. Depending on which number is correct, changes might be needed in the text on page 23, and in Table 6. If the 2.9% figure needs to be revised, then a corresponding change would be needed to the figure stated in the text of 97.1% of single grab samples being in compliance with effluent permit limits.	Two errors were identified with this table. The number of Single Grab Results for 5 – 10 MGD was erroneously entered as 10 when it was manually transcribed from the SAS source table to the reformatted table that appears in the WQMP Report. The correct value was 12. This was verified both by comparison to the original source table as well as back calculation of the percent exceedance to the value listed in the source table. This results in the total of 190 samples, which is correct. The 109 was a transposition error. Both values have been verified and corrected in Table 5. The 2.9% exceedance value is correct.
	24	Text summary of Table 9: For clarity, consider adding words to the last sentence: "For 2020, the geometric mean of the reported DMR E. coli geometric mean data was 16 MPN/100 mL for that category (Table 9)."	Language added for clarity.
	25	Table 11 and ¶2: Can the estimated E. coli load for WWTFs classified as intermittent dischargers be calculated? If it can, then I recommend including those numbers in Table 11. If not, it would be appropriate to give a brief explanation in the text, since it is stated that "With the exception of the intermittent dischargers, WWTFs in the <0.1 MGD size category contributed the least amount of bacteria loading."	The Estimated Daily Load is based upon the Mean Daily Discharge. That value is not provided in the source data since these facilities do not discharge on a daily basis as do most other permitted facilities. Clarifying text was added to the accompanying paragraph.
	25	¶2: I recommend including a reference to Table 3, which, in an earlier section, gives the number of WWTFs in each size category. "Although this category represents the largest number of facilities (284 WWTFs, or 31.45% of the total number of facilities, Table 3), the relatively low flow rates…"	Included reference as suggested.
	25	Figure 2 is very informative because it allows the reader to get an overall picture of the time trends during the period 2016-2020.	No changes made.
	25	Figure 2: The bar for the >10 MGD category is missing for the year 2018.	There was a typo in the table that was preventing this bar from showing on the graph. The typo was corrected and the graph regenerated.
	25	Description of Maps 5-8 in ¶4: Consider this alternative for the next-to-last sentence: "On Maps 6 and 8, watersheds that have no outfalls located within their boundary are shown in white to indicate that there are no data. On Maps 5 and 7, no symbols appear on those watersheds."	Added suggested language to provide additional clarity.
	25	Last ¶: "…it should be noted that the density of WWTF outfalls in urban and suburban centers ~~are~~ is much greater…"	Grammar corrected.
	26, 28	Maps 5 and 7: Because the layer for "Major Highways" is not shown, it might be better to delete that item from the map's legend, or to show the Interstate Highway shield (which does appear) as the symbol for them. Because the layer for "Other Roads" is not shown either, that item could also be deleted from the map's legend. I agree with the decision not to show those two layers, as it would add considerable clutter.	Removed "Major Highways" and "Other Roads" from the Map Legend for Maps 5 and 7.
	26-29	Addition of sidebar notes to Maps 5-8, similar to what was done for Maps 9 and 10, would be of benefit.	Added sidebars to Maps 5-8.
	31	Last ¶: Clarify by saying: "Therefore, watersheds with insufficient service area boundary data or no WWTF located within its boundaries may be mapped as having no data (as is done in Map 10) even if SSO events were common in those areas. (The reason for this comment is that watersheds lacking data cannot be distinguished in Table 9.)	Added language as suggested to clarify.

From	Page #	Comment	Response
Tom Douglas Houston Sierra Club	32	Tables 13 and 14: The number of SSOs reported in 2020 is 2,362 and the number of domestic WWTFs reporting SSOs in 2020 is 277. Is the ratio of 8.5 SSOs per SSO-reporting facility during 2020 right? That might be deserving of comment because it seems high.	It is difficult to reduce things to the ratio of facilities to SSOs because it would assume that ALL WWTFs are reporting their SSOs. It also does not take into account the volume of the SSO discharge, so a discharge of 100 gallons would be weighted the same as a discharge of 1 million gallons in such a ratio.
	33	¶1: "In order to determine the primary causes of SSO events, the number of SSO events by reported SSO cause (as reported to TCEQ by the permittees) ~~were~~ was calculated."	Corrected grammar.
	33	Table 15: the numbers in the column for Volume do not add up to 8,705 which is shown as the total.	The volume was corrected to 8,795 x1000 gallons.
	33	¶2: Use the same terminology in the text and in Table 15. ("Power Failure" vs. "Power Outage")	Terminology in text changed to "Power Outage" to match table.
	35	Sentence 1: As an aid to the reader, I recommend a short addition: "Figure 6 shows the reported cause categories as a percentage of the total number of SSO events (N=2,362)."	Added recommended text.
	36	Sidebar comment for Map 9: "Map 9 shows the spatial representation of occurrences of reported SSOs for 2020. ~~the 2020. .~~"	Correction made.
	37	Sidebar comment for Map 10: "Watersheds with insufficient service area boundary data or no WWTF outfalls are shown in white to indicate an absence of ~~as having no~~ data."	Modified text as suggested.
	38	Among the categories of information captured by the City of Houston Sanitary Sewer Overflow Tracking system, I didn't see a category for "cause". Is that right? Even though it might not be possible to assign a cause in the City's real-time system, this limitation might be worthy of comment.	The City of Houston's system does have a database field for recording the cause of the SSO. This information has been added to the description of their tracking software.
	39	¶2: H-GAC (insert the dash)	Corrected.
	41	¶4: Consider adding a reference to the SEP, as follows: "Promotion of OSSF projects, including the Homeowner Wastewater Assistance (SEP) Program;"	Added a reference to the Supplemental Environmental Project.
	43	Map 11: Matching the watersheds shown on the map with their names in the legend at the left is difficult, due to the large number of colors, which can be difficult to distinguish. This could be solved by showing a number within the area of each watershed on the map and listing that number, alongside its name, in the legend.	This map is included not to discuss any particular WPP or TMDL, but to show the distribution and amount of watershed-based plans in the Region. However, we have updated the map to make it easier to determine the location of various WPP or TMDL project areas.
	45	¶3: Consider adding a sentence at the end of this paragraph to the effect that information regarding unpermitted systems is particularly significant because, as will be described below, they represent a majority of all OSSFs in the H-GAC service area.	This is very important information to point out. Language added.
	47	Table 19, Chambers: "Did not incorporate 29 entries labeled as "redesigns" as ~~to~~ they may create duplicates in the database.	Correction made.
	53	Last ¶: "resubmitting them to the Texas Real Estate Commission for ~~an~~ reauthorization."	Corrected typo.

Houston-Galveston
Area Council

Houston-Galveston Area Council
3555 Timmons Lane, Suite 120
Houston, Texas 77027
713.627.3200
h-gac.com

CE0821